INEEL/INT-01-00797

September 2001

INEEL Infrastructure Restoration/Optimization Project (Draft)

Response to Performance Evaluation Measure 2.3.4.1 (Part 3)

SUMMARY

This *INEEL Infrastructure Restoration/Optimization Project* provides cost-effective solutions for the most important infrastructure upgrades needed at the Idaho National Engineering and Environmental Laboratory (INEEL) within the Line-Item Construction Project (LICP) cycle timeframe. The development, analysis, and recommendation in this response achieve Part 3 of Performance Evaluation Measurement Plan (PEMP) Measure 2.3.4.1 by providing justification for requesting capital funding for priority infrastructure to meet continuing mission needs. This response provides development detail with references to supporting documents, which contain the necessary requirements to satisfy Critical Decision-0 (CD-0).

The primary objectives of the LICP development are (a) to upgrade high-priority infrastructure needs for important missions and (b) to find opportunities to relocate/consolidate support functions, thereby avoiding life-cycle and mortgage costs while optimizing operating and maintenance costs. Both actions will effectively reduce the funding gap between life-cycle capital needs and expected capital funding levels.

Scoping this LICP development involved determining limited, but realistic, assumptions and then developing a prioritization process for selecting infrastructure life-cycle needs from the long-range plan for the 2004 through 2010 LICP cycle (see Section 1.3.2). The primary assumption was that INEEL site laboratory facility needs will be satisfied with the separately funded construction of a consolidated laboratory. Thus, identified life-cycle capital needs for important laboratories are not addressed in this LICP development. However, if the consolidated lab project is not funded for construction, then mission-critical lab needs would either have to be added to this LICP or be submitted as separate, new General Plant Project (GPP) requests.

Recommendations

The following 10 subprojects met the mission need criteria. After a preconceptual alternative analysis for each subproject, these likely cost-effective solutions are recommended for conceptual design (totaling $78.8M total project cost [TPC] escalated):

1. Replace the existing Central Facilities Area (CFA) substation high-voltage bus and insulators with modern design equivalents. This is the only alternative for ensuring safe, reliable power distribution for INEEL missions. Selling the INEEL electrical power distribution system to a power company is a possibility that will be pursued during the conceptual design. ($1,930K)

2. Perform upgrades to Chemical Processing Plant (CPP)-606 electrical and mechanical systems. These various problem solutions are critical for sustaining the utility needs for critical Idaho Nuclear Technology and Engineering Center (INTEC) programs. Replace the roof. The existing asbestos roof is a continual safety and health threat. Such risks would not go away with major repairs. ($5,060K)

3. Replace INTEC demineralization distribution piping. This system delivers 2,000 gallons per day to five facilities. Frequent repairs are necessary to keep this 20-year-old, 3-in. plastic piping functional. ($1,570K)

4. Upgrade INTEC emergency communications system. Maintenance costs were $79.5K last year, and spare parts are becoming harder to acquire for this antiquated system. Two failures last year lasted over 24 hours each time. Noncompliance and lack of direct occupant notification for most INTEC buildings puts property and lives at risk. ($14,730K)

5. Upgrade CPP-663 potable water system. This simple reroute and connection option solves the serious health risks most economically as compared to the three other alternatives. ($370K)

6. Upgrade INTEC fire alarm system. Spare parts are becoming extremely difficult to acquire for this old failing system. Noncompliance with five national life safety codes is a major concern. $228K per year is required to keep the system operational. An upgrade is the only solution to overcoming this unreliable, expensive, and risky situation. ($11,860K)

7. Replace high-voltage mission-critical transformers, breakers, and switches. These critical transformers average just over 45 years old, far exceeding their design life. Selling the INEEL electrical power distribution system to a power company is a possibility that will be pursued during the conceptual design. ($30,380K)

8. Upgrade road systems. Continued reconstruction and chip/seal upgrades are necessary to support vehicle shipments of fuel and waste. ($8,200K)

9. Modify INTEC facilities to accommodate crafts and warehouse move from CFA. ($2,060K)

10. Upgrade IF-602 heating, ventilating, and air conditioning (HVAC) system and electrical system. Adequate cooling of the office areas can no longer be achieved. With increased PC usage, the existing 300-KVA transformer is operating at capacity. Replace IF-603 fume exhaust system. The existing mild steel ductwork has serious corrosion effects from acid fumes. ($2,643K)

Alternatives

Alternative solutions for each of the subproject problems were generated and preconceptualized. A more detailed analysis/evaluation will be performed during the conceptual stage. The estimates shown above were provided for the most likely cost-effective alternative for each of the subprojects. A summary of the alternatives follows (each number corresponds to the subproject numbers used above):

1. Doing nothing will eventually result in a total unplanned power outage for the entire site. The cost of program interruptions and potential environment, safety, and health (ES&H) problems/accidents cannot be easily estimated.

2. Doing nothing to the electrical system will result in inadequate lighting, crumbling wire insulation, and old panel boards continuing to be safety hazards. Doing nothing to the water softener will continue to require extra labor to operate/maintain and purge excessive amounts of sodium to the waste system. Doing nothing to the raw water pumps will continue to require excessive material and labor costs. Doing nothing to the acid tank foundation will continue the deficient condition relative to seismic requirements. Doing nothing to the 50-year-old air receivers will eventually impact programs with a tank outage caused by high-pressure failure or condemnation. Doing nothing to the roof could eventually lead to an area closure due to uncontrolled release of friable asbestos, severely impacting all INTEC programs. Such impacts cannot be easily estimated.

3. Doing nothing to the demineralization line will continue to cost excessive repair time in this confined space tunnel and impact program operations.

4. The consequences of not upgrading the emergency communications system will be continued occupant exposure risk, high maintenance costs, unreliability, and code violations.

5. If the potable water system is not upgraded to comply with standards, it is clear that the potential for contamination of the potable water in CPP-663 will continue.

6. The consequences of not upgrading the fire alarm system will be undue risk, continued high maintenance costs, noncompliance, unreliability, and partial inoperability of the system. A partial shutdown due to lack of spare parts would result in a serious life safety compliance problem.

7. Not replacing the high-voltage equipment with either new or used rebuilt will eventually have serious consequences. Failure will simply result in a power loss, which in some situations could last for weeks. Locating and getting costs on suitable used, but warranted, transformers will be pursued during conceptual design.

8. It is a fact that if roadways are not periodically upgraded they will cost considerable more money to repair/reconstruct at a later date. There is a critical point on a pavement condition-rating diagram (deterioration curve) where if rehabilitation is not performed, after a small percentage of time, the cost will escalate dramatically. Only those roadways that are essential for fuel and waste shipments will be upgraded.

9. Doing nothing eliminates the $2.5M in annual savings and $25.7M in avoided life-cycle capital costs through FY 2010.

10. Doing nothing to the HVAC system will result in continued discomfort for 300+ employees and unplanned outages. Doing nothing to the electrical system will sustain the noncompliant status and also inhibit growth. Doing nothing to the lab exhaust system will eventually cause the system to be inoperable. This would impact a large majority of the research activities.

Drivers

The overpowering drivers for capital upgrades are the schedules for the INTEC programs. For example, high-level waste has to be treated and ready for shipment by 2035. Repackaging and shipments of spent nuclear fuel will essentially take place during this same timeframe. Consequently, the infrastructure at INTEC supporting that activity has to be serviceable throughout the period at a minimum. Some will be required beyond 2035.

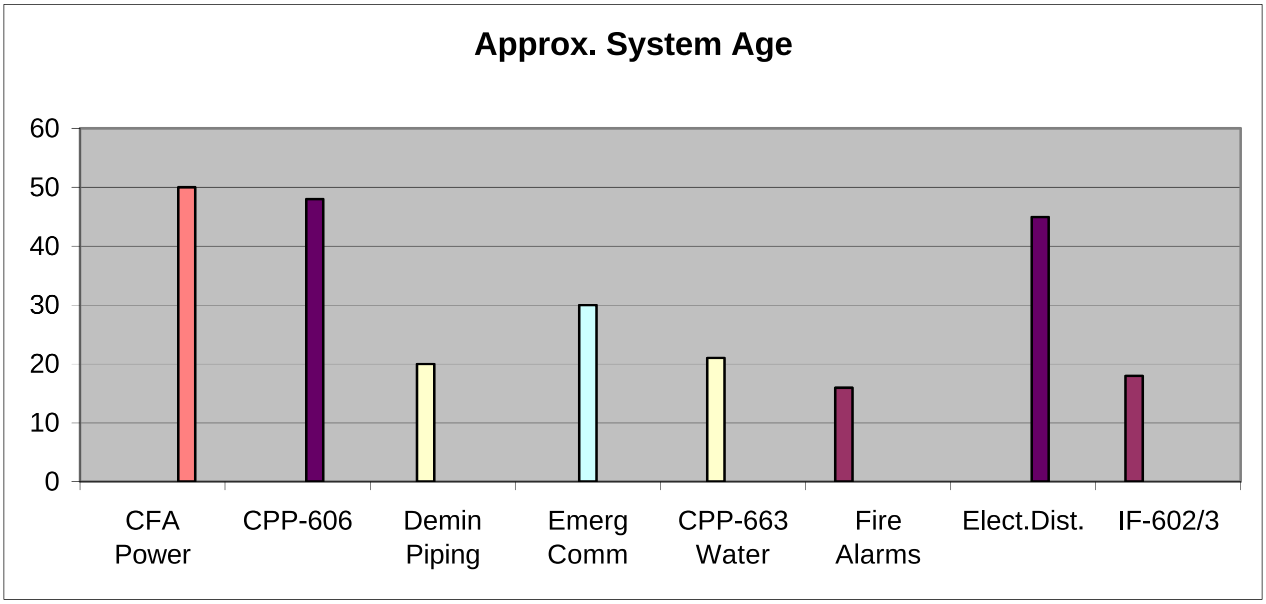


Figure S-1. Approximate age of INEEL systems.

Benefits

The primary benefit of this project is the restoration of infrastructure critical to important INEEL missions. In addition, through “Facility Closure,” the infrastructure optimization opportunity portion of this LICP provides over $2.5M in saved labor, power, and heating costs annually. It also provides over $27.2M in avoided life-cycle capital costs through fiscal year (FY) 2010, reducing the cumulative capital funding gap by $106M (see Figure S-2).

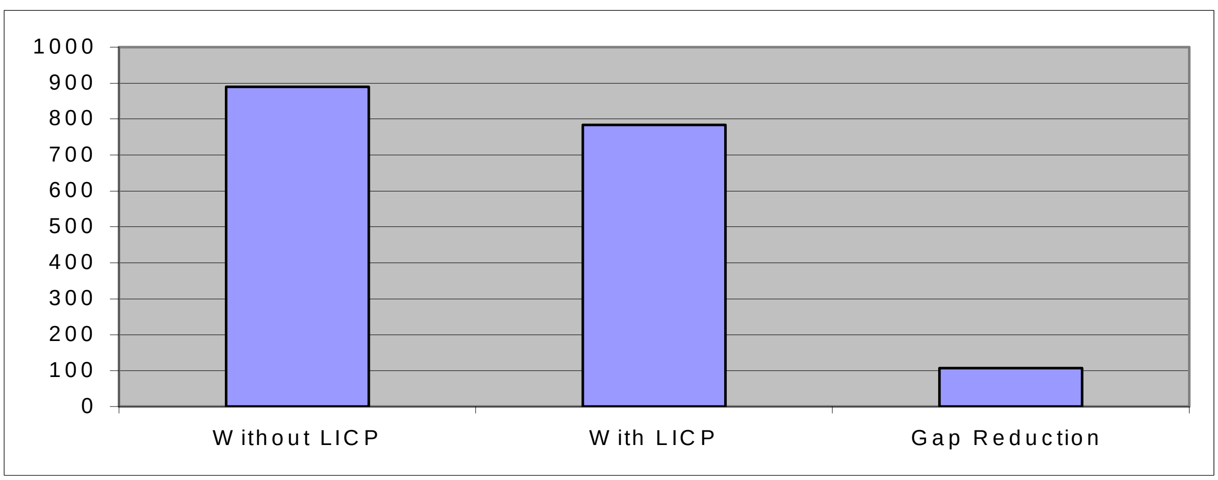


Figure S-2. Cumulative Capital Gap Comparison FY 2010 ($M).

While most of the other subprojects mitigate mission-critical, environmental, safety, and health issues, they contribute to significant avoided costs related to accidents, lost productive time, and government fines. However, it would be difficult to estimate such cost benefits. As with most life-cycle facility needs, continuing deterioration resulting from deferred maintenance will significantly accelerate the future repair/restoration costs of existing buildings. Collectively, all of the subprojects contribute toward reducing the gap between expected out-year funding allocations and projected life cycle funding needs.

Project Development

A priority system was developed to capture all the mission-critical needs. It uses a decision-tree approach. Criteria for Priority 1 (very high), Priority 2 (high), Priority 3 (medium), and Priority 4 (low) were generated. INEEL area planners used the definitions of the terms and applied the process consistently to select the 10 subprojects out of the more than 400 life-cycle capital entries.

The needs for each of the selected infrastructure subprojects were determined and validated. A procedure was used to quantify objective justifications. Applicable engineers were assigned to generate alternative solutions and create a preconceptual approach. The respective investigators/stakeholders performed a preliminary risk analysis, and each subproject was professionally estimated.

CD-0 Requirements

A team leader and a certified project manager guided the process through the Critical Decision-0 (CD-0) requirements for these subproject proposals. Management and operations contractor responsible CD-0 requirements for this LICP development include:

- *Justification of Mission Need*, which cites the selected subprojects as those being the highest priority life-cycle needs for providing essential infrastructure support to significant long-term program missions.
- *Acquisition Strategy,* which recommends using the contractor resources to design, procure, and manage the construction of each subproject.
- *Preliminary National Environmental Policy Act (NEPA) and Permitting Strategy* for the subprojects is expected to be covered by a Categorical Exclusion based on preventive maintenance and safety and health improvements to the workplace.
- *Project Technical and Organizational Interfaces* are the LICP proposals for the new and/or upgraded INEEL laboratory facilities. Failure to fund this proposal could add to the scope of this project.
- *Project and Engineering Design* may have to be modified to reflect changes in scope.
- *Alternative Analysis* for each of the subprojects for this preconceptual phase is presented in the Mission Need submittal.
- *Initial Risk Management Plan* was developed and impacts were evaluated. No serious problems were discovered.
- *Functional Design Requirements* for each subproject were researched and listed.
- *Technology Development* is not required for any of the subprojects.

Because the FY 2002 budget and staffing uncertainties may prevail into the first quarter of FY 2002, the Mission Need Document should be reassessed for priorities and cost effectiveness as soon as these budget and staffing issues are resolved. Most of the subprojects may still be warranted, but it is possible that the optimization/consolidation opportunities can be performed much earlier.

CONTENTS

FIGURES

TABLES

ACRONYMS

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
ATR	Advanced Test Reactor
BNFL	British Nuclear Fuels, Ltd.
CAMP	Capital Asset Management Plan
CD	Critical Decision
CFA	Central Facilities Area
CFR	Code of Federal Regulations
CPP	Chemical Processing Plant
CUCS	consolidated utility control system
D&D	decontamination and decommissioning
DOE	Department of Energy
DOE-ID	Department of Energy Idaho Operations Office
EC	Environmental Checklist
ECS	Emergency Communication System
EM	Environmental Management
EO	equipment operator
FY	fiscal year
GPP	General Plant Project
HPIL	health physics instrument laboratory
HVAC	heating, ventilating, and air conditioning
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminated Engineering Society
INEEL	Idaho National Engineering and Environmental Laboratory

INTEC	Idaho Nuclear Technology and Engineering Center
IRC	INEEL Research Center
LICP	Line-Item Construction Project
M&O	management and operating
MCP	Management Control Procedure
NEC	national Electric Code
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
PCI	Pavement Condition Index
PEMP	Performance Evaluation Measurement Plan
PPE	personal protective equipment
PVC	polyvinyl chloride
RWMC	Radioactive Waste Management Complex
SCADA	Supervisory Control and Data Acquisition
SDA	Subsurface Disposal Area
SMC	Specific Manufacturing Capability
TAN	Test Area North
TEC	total estimated cost
TPC	total project cost
TRA	Test Reactor Area
TSF	Technical Support Facility
UPC	Uniform Plumbing Code
VFD	variable frequency drives
VPS	Voice Paging System
WROC	Waste Reduction Operations Complex

Infrastructure Restoration/ Optimization Project

1. MISSION NEED

This *Infrastructure Restoration/Optimization Project* responds to Part 3 of the Performance Evaluation Measurement Plan (PEMP), Measure 2.3.4.1 assigned per Change Control Form 210.01, dated January 11, 2001, which states:

> "By September 30, 2001, provide to DOE-ID documentation based on the INEEL Infrastructure Long-Range Plan which supports the need for 1) new and/or upgraded INEEL laboratory facilities, 2) engineering, research and administrative support buildings(s), and 3) INEEL infrastructure restoration of the necessary utilities, roads, roofs, mechanical systems, etc., and other supporting INEEL infrastructure to meet currently identified INEEL missions. Recommendations will be developed for the purpose of significantly narrowing the INEEL Infrastructure funding gap identified in the INEEL Long-Range Plan Executive Summary. The deliverable will include the steps necessary in the Preconceptual Phase of the Acquisition Process to satisfy Critical Decision-0 (CD-0). Those steps will include an acquisition strategy, alternative analysis, functional design requirements, preliminary cost and schedule estimates and a justification of mission need. The recommendations will also address any union issues, safety and health considerations, and articulate in some detail the estimated savings, cost avoidance, and other benefits.
>
> As development of the infrastructure optimization options and recommendations progresses, documentation will be provided by the contractor as a means of keeping the customer apprised of progress and issues, and for the benefit of collecting customer input and expectations for the path forward. This documentation will be provided on a scheduled basis as milestones."

Much of the Idaho National Engineering and Environmental Laboratory (INEEL) infrastructure was constructed in the 1950s and 1960s—and some of these major systems have to be serviceable beyond 2035—a challenge indeed (see Figure 1).

PEMP Measure 2.3.4.1 was assigned at the beginning of fiscal year (FY) 2001. In April 2001, however, it was announced that 1200 employees would be reduced by FY 2002. Environmental Management (EM) funding could be reduced resulting in even more workforce reductions. Depending on the final budget, 1,200 to 2,000 employees may be released. It may be late in FY 2001 before the final decisions are made. The employee population reduction will create opportunities to abandon and close high-cost facilities, terminate leases, and consolidate selected activities. Such changes in infrastructure needs obviously influence details for responding to the PEMP measure. These uncertainties may not be resolved until next fiscal year; thus, a recommendation cannot be presented that would fit the uncertain future. Therefore, the resulting recommendation abides by PEMP Measure 2.3.4.1, but it also suggests that a new assignment for FY 2002 be developed to reengineer the infrastructure plans.

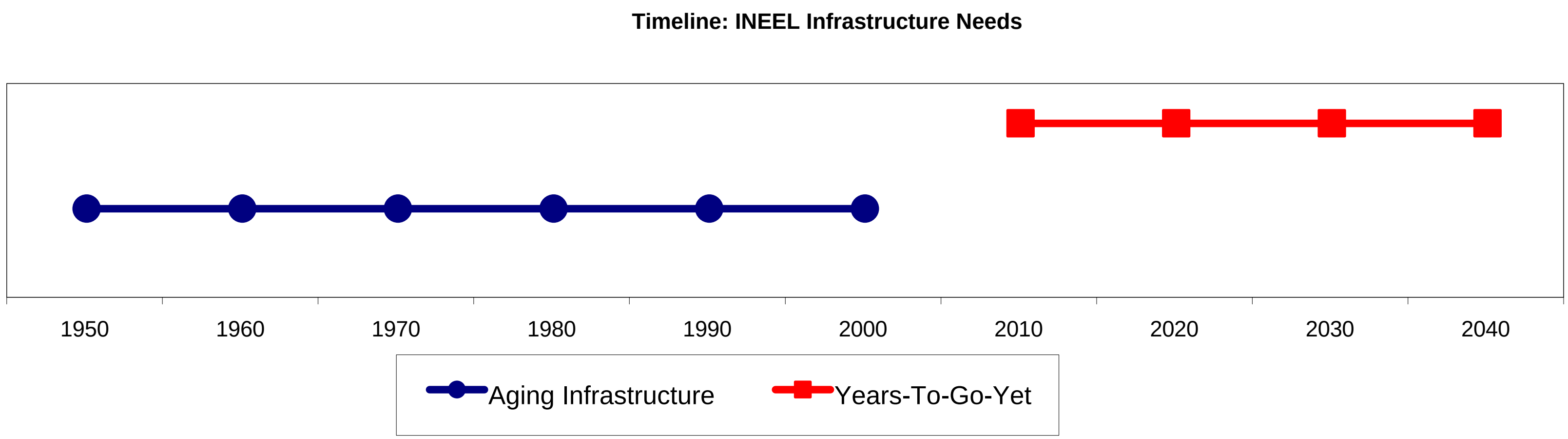
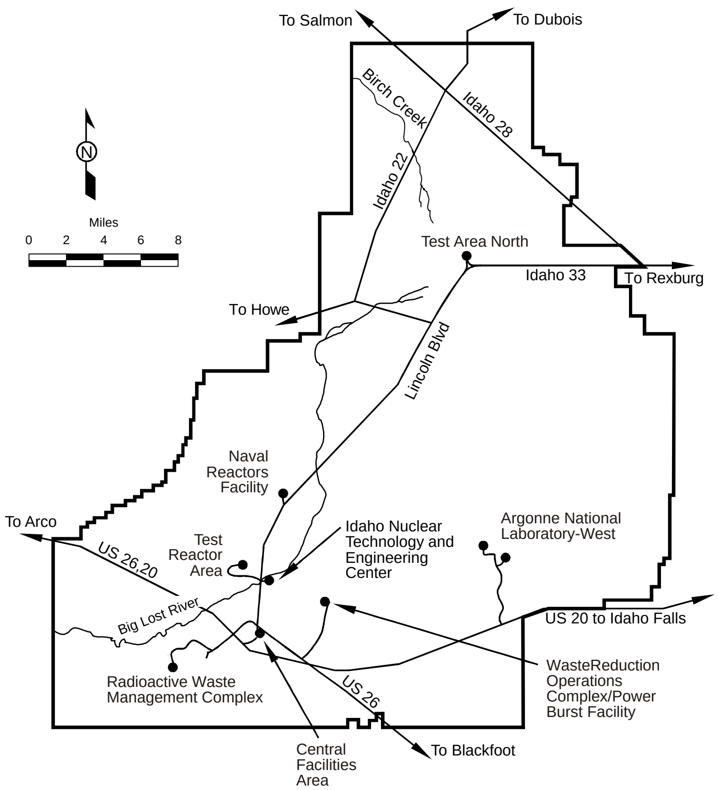


Figure 1. INEEL Infrastructure needs timeline.

This project, in conjunction with the *Justification of Mission Need Document for the INEEL Consolidated Laboratory Complex Project*, proposes to upgrade INEEL mission-critical infrastructure to facilitate meeting mission needs and to reduce overall long-term facility capital upgrade and maintenance costs at the INEEL. The Infrastructure Restoration/Optimization Project will concentrate on upgrading only those remaining facilities, structures, and utilities that are mission critical or needed to support mission-critical activities to reduce the gap between projected out-year funding allocations and funding needs. Without this reduction, the gap is forecast to increase significantly over the next decade inhibiting the INEEL's ability to support the identified DOE missions without substantial funding increases.



1.1 Background

Two innovations were developed to address the issue of the INEEL's extensive life-cycle capital needs: (1) build a consolidated laboratory at INTEC to replace the severely deteriorating labs at the site; and (2) group mission-critical infrastructure upgrades into a Line-Item Construction Project, which includes an infrastructure optimization opportunity that provides over $27.2M in avoided capital costs through FY 2010.

In early FY 2000, the INEEL developed and published the *INEEL Infrastructure Life Cycle Capital Plan,*[1] which integrated information on expected area closures and subsequent population changes. All the elements of asset management were considered to generate the life cycle capital plan for each INEEL facility. That document evolved into the *INEEL Infrastructure Long-Range* Plan,[2] which provides a forecast of the INEEL infrastructure. In addition, the *INEEL Projects Five-Year Plan* [3] was developed to provide a compilation of all near-term INEEL project needs. Combined, the Long-Range Plan and the Projects Five-Year Plan provide the basis for this *INEEL Infrastructure Restoration/Optimization Project* assignment by identifying the infrastructure needs for the time period FY 2004 through 2010.

The Executive Summary of the *INEEL Infrastructure Long-Range Plan* presents a Gap Analysis wherein the life-cycle costs (including capital, maintenance, and decontamination and decommissioning [D&D]) are compared to expected funding levels. The INEEL is a 50+ year-old laboratory and the life-cycle capital needs are extensive; consequently, the funding gap is significant. This funding issue may be partially resolved by consolidating many of the INEEL infrastructure needs.

Two innovations were developed: (1) build a consolidated laboratory at the Idaho Nuclear Technology and Engineering Center (INTEC) to replace the severely deteriorating labs at the site; and (2) group mission-critical infrastructure upgrades into a Line-Item Construction Project (LICP). This second innovation, the purpose of this document, also includes an infrastructure optimization opportunity, which provides over $27.2M in avoided capital costs through FY 2010. The two ideas are combined in PEMP Measure 2.3.4.1 for the development of two separate LICPs.

This project proposes to upgrade mission-critical infrastructure in an effort to reduce overall long-term facility capital upgrades and maintenance costs at the INEEL. Overall, the project proposes to reduce the gap between out-year funding allocations and projected funding needs. Without this reduction, the gap is forecast to increase significantly over the next decade—inhibiting the INEEL's ability to support the identified DOE missions.

1.2 Discussion of General Infrastructure Needs for the INEEL

The INEEL's infrastructure consists of facilities, structures, and utilities that support the DOE's mission areas of Environmental Quality, Energy Resources, National Security, and Science and Technology. To fully support these missions, the INEEL infrastructure program must be aligned with the initiatives each mission area considers critical to successful accomplishment of its goals and objectives. These initiatives require a diverse supporting infrastructure that is maintained during the life of the mission by adequate investment in repairs, upgrades, and replacements. The mission timelines must be evaluated against the infrastructure condition and informed decisions made on the needed investment necessary to maintain the asset's capability.

The INEEL infrastructure supports base operations that provide and maintain facilities/systems in safe, functional conditions to protect the public, workers, environment, and equipment. Specific missions are supported in the areas of waste treatment, remediation, and disposal; spent nuclear fuel storage and disposal; packaging and shipping of waste forms to permanent sites; and research and development of wastes, nuclear reactors, and scientific technologies.

The INEEL's infrastructure consists of facilities, structures, and utilities that support the DOE's mission areas of Environmental Quality, Energy Resources, National Security, and Science and Technology.

1.2.1 Central Facilities Area Needs

Currently, the Central Facilities Area (CFA) is the service and support center for programs located at other primary facility areas on the INEEL. These services include transportation, maintenance, environmental and radiological monitoring, security, fire protection, warehousing, training, calibration and instrumentation laboratories, medical, and other administrative support offices. The buildings at CFA are, on average, 30 years old, and several of the utility systems that support these buildings are 40 years old. Replacement or significant upgrades of these buildings and systems will be required for CFA to reach the mission end date of 2052 unless alternate facilities can be located to perform similar functions.

The construction of a new consolidated office building and a consolidated laboratory facility will reduce future CFA infrastructure needs by solving most office and laboratory space requirements. Furthermore, warehousing and CFA craft and maintenance functions are proposed to be consolidated at INTEC, to further reduce CFA's infrastructure requirements. These combined actions will eliminate numerous facilities, leaving CFA's long-term mission focused on support services for fire protection, medical, transportation, security, health physics instrument laboratory (HPIL), and telecommunications.

1.2.2 Idaho Nuclear Technology and Engineering Center Needs

Currently, the INTEC's mission is the interim storage of spent nuclear fuel and the storage and processing of high-level waste. The long-term mission of INTEC is to transfer all spent nuclear fuel from wet storage to dry storage, prepare it for long-term disposal, and transfer it to the disposal site. All high-level waste must be immobilized and packaged to meet long-term disposal requirements. Significant investment will be required in facilities and utilities to meet these objectives by 2035. Key laboratory, production/plant, and service facilities are in poor condition and will require extensive infrastructure upgrades to meet life-cycle needs. In addition, portions of the utility systems need upgrades within the next 8 years to support INTEC's mission.

Significant activity will be centered at INTEC in the next 33 years to complete mission-critical tasks necessary to meet State milestones and accomplish removal of waste and spent fuel. It is critical that the INTEC infrastructure be maintained in a satisfactory condition to support INTEC's mission.

The construction of new consolidated laboratory and office facilities will reduce needed infrastructure upgrades at INTEC for laboratories and offices. Personnel presently located in existing laboratory and office facilities would be expected to move to the newer facilities minimizing any need for upgrades of existing facilities. Infrastructure upgrades/replacements will still be required for existing process, service, and warehouse facilities and utility systems, to meet end-state dates in support of INTEC missions. These facilities and utility systems are independent of upgrades for laboratory or office facilities.

1.2.3 Site-wide Area Needs

The Site-wide area is outside the boundaries of primary facility areas. This widespread area contains utility, communications, and transport systems that serve the primary facility areas. A few facilities in the Site-wide area are needed to support specific missions for the INEEL. Presently, the facilities are in good condition and significant upgrades are not expected. Roof repair/replacement at some of the facilities that support security functions will be the major facility work.

Site-wide common-use upgrade needs are primarily in the electrical distribution and road systems. Transformer replacements throughout most of the INEEL substations are needed to provide efficient, reliable power distribution to the primary facility areas to support mission-critical operations. The proposed road upgrades would rebuild INEEL roads and bridges in support of future environmental restoration projects, fuel shipments for storage and processing, new programs, and overall INEEL infrastructure operations. Without the upgrades, deterioration will occur and limitations will be placed on the roads for the movement of vehicle traffic, particularly large loads such as cask shipments.

1.2.4 Radioactive Waste Management Complex Needs

All areas of the Radioactive Waste Management Complex (RWMC) with the exception of the Subsurface Disposal Area (SDA) will be transferred to British Nuclear Fuels, Ltd. (BNFL) when the Advanced Mixed Waste Treatment Facility commences operation in 2002. Only a minimum of infrastructure upgrades will be required to maintain the necessary facilities/utilities for the SDA and other minor operations at the RWMC. The site-wide upgrades are expected to provide BNFL with utilities and roads necessary to support their mission.

1.2.5 Test Area North Needs

Drastic reduction in activities and manpower will be completed at the Technical Support Facility (TSF) this fiscal year. Closure of remaining operations at TSF will occur around 2004. Thereafter, items that must be maintained are utilities for water, communications, and power to maintain active programs at the Specific Manufacturing Capability (SMC) Program and minimal support for TSF.

1.2.6 Test Reactor Area Needs

The primary mission at the Test Reactor Area (TRA) (Figure 2) is the operation of the Advanced Test Reactor (ATR) and its supporting facilities/systems. The ATR will operate indefinitely; thus, TRA will require infrastructure upgrades over the coming years. Capital projects are expected to be funded by other than EM sources. The new office building and laboratory facility proposed to be located at INTEC is expected to reduce some infrastructure requirements necessary to support the ATR. Warehouse, shops, and other support facilities will require upgrades and replacements in some cases. Utility systems requiring upgrades include water, plant air, communications, and sanitary waste.

Figure 2. Along with its existing critical mission, TRA will be instrumental in fusion fuel research and Generation IV reactor development.

1.2.7 Waste Reduction Operations Complex Needs

No upgrades are planned for the Waste Reduction Operations Complex (WROC) due to accelerated closure objectives.

1.2.8 Idaho Falls Area Needs

The Idaho Falls area includes facilities for training, administration, technical support, computer operations, and laboratory research. The new office building and laboratory proposed for the site will not reduce any of the needs for in-town office or laboratory space. The technical, administrative, and training facilities provide direct support for site operations necessary to meet State milestones and ensure safe, reliable facilities and utilities. The laboratory facilities in the Idaho Falls area provide fundamental and applied research and development in science and engineering disciplines necessary for DOE's national missions. The laboratory and computer facilities support both site operations and research activities on a wide spectrum of projects.

Most of the DOE-owned facilities in the Idaho Falls area are in good condition. The primary needs are in upgrades to systems within existing facilities to meet support system needs. Utility supply systems are maintained by those utility organizations.

1.3 Project Scope Development

The basis for the project proposals to be combined in this LICP Restoration/Optimization project is found in the Life-Cycle Capital Needs tables of the *INEEL Infrastructure Long-Range Plan.* Given the life-cycle capital needs, the next steps were to determine appropriate assumptions and devise an easy-to-apply prioritization process for selecting only those infrastructure needs within the FY 2004 through 2010 LICP cycle timeframe that would meet the priority and cost savings objectives.

Each proposal was investigated through a formalized procedure to determine the need and timing. Then, alternative solutions (preconceptual) were generated, estimated, and analyzed for cost-benefit comparisons. The resulting list of screened capital construction needs is the overall project scope.

1.3.1 Assumptions

Assumptions in the scope and structure of this LICP include:

- Site laboratory facility infrastructure needs will be satisfied with the construction of a Consolidated Laboratory. Thus, identified life-cycle capital needs for important laboratories are not addressed in this LICP development.
- Research and development activities (and associated infrastructure), as presented in the *FY 2001–2005 Institutional Plan,* are crucial to the future of the INEEL.[4]
- Inactivation costs for buildings that are vacated as a result of this project are not included. These costs will continue to be borne by the tenant group or the affected landlord organization.
- Given a flat (or decreasing) funding scenario, a reduction of approximately 1,200 to 2,000 contractor employees will be effected by the end of FY 2003. While this increases the uncertainty of mission and support requirements, it also provides more options for facility selection/optimum utilization in relocating and consolidating personnel and equipment.
- The proposed FY 2004 General Plant Project (GPP) to upgrade Chemical Processing Plan (CPP)-1636 and CPP-1637 for multicraft shop activities will be accomplished. This action would facilitate proposed CFA craft relocations to INTEC in FY 2007.
- The Test Area North-Technical Support Facility (TAN-TSF) and WROC areas will be shutdown and will not require future upgrades. The RWMC area will be managed and operated by others.

1.3.2 Prioritizing Life-Cycle Capital Needs

Given that future GPP and LICP requests will only be submitted for essential needs, some manner of prioritizing assets was required. Thus, a process was developed to address this strategy and facilitate consistency in assigning a rank of importance for buildings, structures, and systems at the INEEL.

In addition, because almost all assets (and components of assets) could be rationalized to be extremely important to the INEEL's missions, some degree of uniqueness with respect to timing was also needed. The decision-flowsheet (see Figure 3) and associated definitions show the process developed for prioritizing (quantifying) infrastructure assets. The steps for determining infrastructure investment priorities were:

1. Apply decision-flowsheet and associated definitions to prioritize the asset.

2. Investigate the life cycle problem/need (see *Infrastructure Long-Range Plan, Appendix A*) with respect to the criticality of its physical component(s). (Note: *Critical components* are defined as any building, structure, or system part(s) whose immediate failure would seriously jeopardize a Very High or High priority asset, where no available substitute can be utilized to mitigate the situation, and/or whose failure would after a few weeks continue to seriously impact that mission.)

3. Rank similar priorities needed for each given year relative to each other.

4. Apply standardized mission need development process.

The application of the definition for critical components is not necessarily absolute. However, when it is used in conjunction with the decision-flowsheet (and related definitions), consistency of application definitely improves. Components of priority assets should be examined for realistic scenarios. Some examples would be:

- A suspected roof failure on a building that houses a primary mission operation during the winter/spring months could impact that mission for greater than two weeks. Thus, the roof is a critical component.
- Renting tank bladders or tanker trailers can mitigate the loss of a fuel tank. Likewise for air compressors, transformers, and boilers that can be rented and deployed within 36 hours. Thus, the component may be part of a high-priority asset, but it is not considered critical.
- Promptly getting a permit for another landfill is unlikely, but cold waste materials could be stockpiled or hauled elsewhere.
- Spent nuclear fuel and other nuclear-related waste containments are unique.
- Water wells, substations, and firewater storage tanks cannot be substituted quickly.

The simple priority system uses a decision-flowsheet approach. Priority 1 (Very High) follows from answering “yes” to the question, “Does asset directly host primary program mission, Category 2 material, or life safety activities?” Priority 2 (High) follows from answering “yes” to the question, “Is asset key to meeting environmental/legal milestones, or does asset provide primary support to program mission, or host Category 3 materials?” Priority 3 (Medium) follows from answering “yes” to the question, “Does asset contribute significant support to program mission, or is asset key to complying with other environmental requirements?” All others are deemed a Priority 4 (Low).

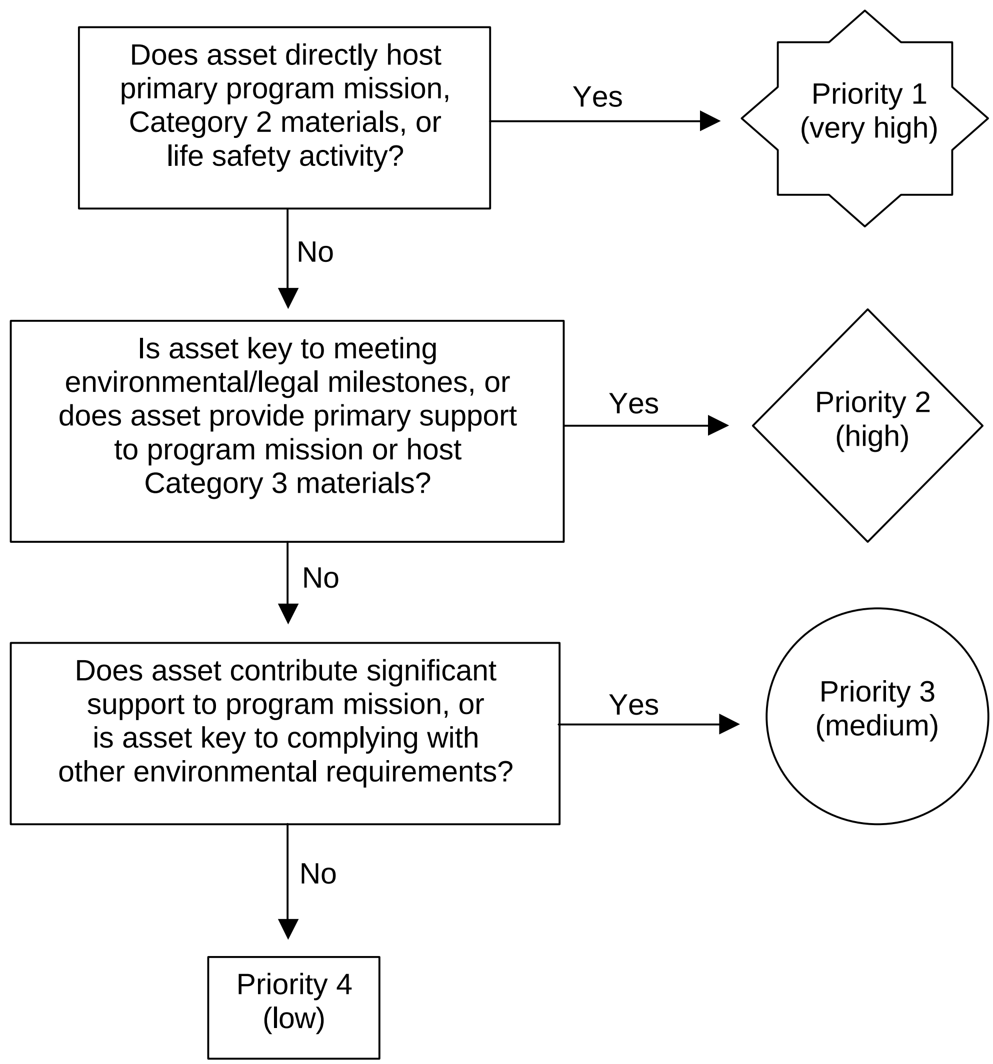


Figure 3. Infrastructure Investment Priority—Decision Flowsheet.

The following definitions are used in the Infrastructure Investment Priority process:

- *Asset* is any real property building, structure, or physical system.

- *Category 2* materials refer to specific DOE-STD-1027 classification of consequences of unmitigated release of hazardous radioactive materials. In Category 2 Hazard, the analysis shows the potential for significant onsite consequences. Category 2 facilities have been identified. See http://webbeta/nuclear/index.htm (from the INEEL Home Page click on Facilities, click on Nuclear Facility Managers and Facility Management, click on Nuclear Facilities, Pick an Area). Potential offsite release does not exist with Category 2 materials.

- *Category 3* materials refer to nuclear materials where the potential exists for only significant localized consequences.

- *Contribute Significant Support* means providing a service that could be delayed for only a few weeks, or could be performed by some other entity. Some examples would be calibration laboratory, analytical laboratories, craft shops, roadways, and warehousing.

- *Primary Support* would provide an essential service such as safety, utilities, security, telecommunications, and HPIL.

- *Directly* means actually housing the program activities or a component of the program activity.

- *Key to Complying* means it meets the letter of the law and, in absence, would lead to punitive monetary fines.

- *Life Safety* refers to crucial services that mitigate life-threatening conditions. Examples would be medical and fire protection.

- *Primary Program Mission* pertains to funded programs, fundamental to the achievement of INEEL objectives, such as Spent Nuclear Fuel, High-Level Waste, Environmental Restoration, Nuclear and Process-related Research and Development, and Waste Management activities related to the Settlement Agreement. Most of these have legal milestones attached to their funded schedules.

1.3.3 Optimization Opportunity/Innovation

Along with the opportunity for consolidating high-priority capital needs into a LICP, an innovative idea was generated to further optimize infrastructure at the site. The idea consists of modifying a few existing facilities at INTEC to accommodate the relocation of all necessary craft and warehousing functions from the CFA, in FY 2007.

The demand for craft labor at CFA is projected to be reduced over the next five to seven years due to:

- Reduction in force and potential budget reductions
- The decision to close TAN early
- The likelihood of a near-term closure of Waste Reduction Operations Complex/Power Burst Facility
- The possible consolidation of CFA (and some INTEC) offices into a new facility outside the fence at INTEC
- The possibility of moving the Radiological and Environmental Sciences Laboratory to the new consolidated laboratory at INTEC.

Thus, it makes sense to start planning significant cost-benefit projects. In this case, avoided life-cycle capital costs for all the warehousing (101,329 ft^2) and craft-related (79,960 ft^2) savings at CFA could amount to approximately $27.2M through FY 2010. Operation and maintenance cost savings would also be significant.

In this plan, the only occupied facilities remaining at CFA in 2008 would be the Fire Station, Dispensary, Transportation Complex, Calibration Laboratory, Security, and HPIL. The incremental additional spare parts storage and craft shop needs required at INTEC are greatly reduced from their present levels at CFA. The space needs for relocating necessary CFA crafts to INTEC in FY 2007 are discussed below.

Space required for moving the CFA-624 portion of Power Management to INTEC in FY 2007 includes:

- Storage (4,000 ft^2)
- Garage for 1 small truck and 4 large trucks
- Shop space for 9 lineman
- Office space for 18 people (assume they would go into the new Site Engineering and Resource Facility)
- The transformer yard would be relocated near the CFA Dispatch/Control facility, which will remain in place.

The space required for relocating the CFA warehousing function to INTEC in FY 2007 is based on the following assumptions:

- RWMC and TRA spares and all site common spares will be relocated to CFA-601 in FY 2001; then, when all the functions in CFA-601 are relocated to INTEC in 2007, a total of 25,000 ft^2 will be required. Six full-time equivalents would be relocated at that time. However, it is highly preferred that the non-INTEC material be in a facility outside the INTEC fence. In addition, it is essential that a suitable, order- and code-compliant space for chemical storage be made available. Specific physical needs were prepared for the recent Request for Proposal for a town warehouse, and these same specifications are to be used for finding/modifying space at INTEC. The outside storage yards at CFA would continue to be utilized. Adequate access would be required for the yards.

- Because the Excess Disposition activity takes up so much space (most of CFA-674 along with a large outdoor yard), it would be most cost-effective to maintain that operation at CFA under one of three scenarios.
  (1) Continue using CFA-674 but with newly installed overhead and portable radiant heaters for work areas (Note: as soon as the craft shops and CFA-601 are vacated, the steam plant would be inactivated), or (2) move the excess warehousing activity into a portion of CFA-601, again installing overhead and portable radiant heater for work areas, or (3) move the excess warehousing activity into one of the craft shops, constructing a truck well/dock and radiant heaters. Other possibilities would be to outsource that activity or relocate it to Idaho Falls.

1.3.4 Procedure to Ascertain Need

The following six steps were developed recently for generating the Mission Need document. The Mission Need is an investigation of a problem. The purpose is to generate alternative solutions for the problem. The exercise also helps answer probable questions about project funding. The completeness of this problem/need analysis should also help promote management support. The example in the steps below provides guidance to help describe the procedure.

1. <u>Prepare problem statement</u>. The statement should be valid and process-oriented, as opposed to being facility/hardware-oriented. For example:

   > Existing water disinfection systems leak/alarm too often (not water disinfection system needs replaced).

2. <u>Qualify and quantify the problem as much as possible, giving factual information</u>. For example:

   > Five chlorine leaks and 14 false alarms in the six different systems have occurred over the last two years. Each time the Fire Department responded to the emergency, and maintenance corrected the cause. This cost an average of $775 per occurrence and is unsafe if an actual leak occurred.

3. <u>State specific requirements that are driving this problem solution</u>. This step includes the language of laws, regulations, orders, agreements, and management directives and shall not be confused with functional and operating requirements. Differentiate between shall (i.e., must) and should (i.e., want) to determine if any perceived driver is mandatory. Cite section, paragraph, and specific language to prove that the requirement is mandatory, and relate it to the specific problem. Management directives must be documented. Longevity of the mandated activity shall be provided. For example:

   > DOE Order 123.1a (covered in existing management and operating [M&O] contract), Section 4.b. states, "…known unsafe conditions shall be corrected…"; and no exceptions are given. Because of this mandate,

some action must be taken to correct the recurring unsafe chlorine leaks. Safe drinking water will be required beyond the year 2052.

4. Generate alternative solutions. This step identifies functional and operating requirements that must be done. As in Step #3, exercise discipline to rule out wants. The prioritization method discussed earlier should be applied to the problem/solution. If the problem/solution does not result in a high priority, it might be delayed, pending further analysis. Next, a preliminary Capital Asset Management Plan (CAMP) score should be developed.

   At this point (or sooner), it is recommended that Department of Energy Idaho Operations Office (DOE-ID) buy-in be achieved. Then, a cross-section of applicable representatives shall generate realistic alternative solutions. Use the checklist below and provide detailed objective pros/cons for each:

   ___Operational/maintenance action

   ___Renovate/expand existing facility

   ___Privatize or outsource the activity

   ___Build new (town vs. site)

   ___Delay until suitable option is available

   ___Lease facility/equipment

   ___All other viable facilities or combinations that could support the need

   ___Mitigate only the noncompliant items in existing or alternative facility

   ___Other mitigating options

   ___Do nothing.

5. Evaluate alternatives. Only those realistic alternatives that address the "must-do" requirement(s) should be analyzed further. Any alternative addressing "should-do," "want," or "add-on to must-do" requirements shall not be evaluated. Because of limited capital funding, essential selections will allow more essential capital needs to be met.

For the remaining alternatives:

- Being objective, rank the alternatives and weigh the pros and cons for each. A feasibility study and a cursory design may be required. Input from DOE-ID should be included at this point.

- A rough order of magnitude estimate and life cycle cost analysis is essential.

- Your justifications must be valid. Consider all risks.

- Calculating a simple payback may be helpful in evaluating the alternatives.

- For very complex problems or where variables are extremely sensitive, it may be proper to assign a business analyst to address the evaluations.
- Call a meeting of the applicable people and discuss the details. Allow subjectivity where comparisons are marginal. Attempt to gain a consensus on which alternative provides the optimum solution.
- Review and finalize the CAMP score for the proposed project. Perform a funding determination. If the optimum agreed solution meets the capital funding criteria, then move on to Step #6.

6. Writing the Mission Need. Make full use of the knowledge, terms, and emphasis learned above to facilitate writing the Mission Need document. Summarize in writing and in pictorial form all efforts and findings in this total procedure, attaching it to your submittal.

1.3.5 Final List of Selected Sub-Projects

After thorough prioritization and screening of more than 400 candidate subproject proposals in the *INEEL Life Cycle Capital Plan* (for the LICP cycle time period FY 2004 through 2010), 10 capital project candidates qualified for meeting the objectives of the PEMP measure. The selected subproject proposals are presented in Table 1 and Figure 4, and their individual problems are briefly described in the following paragraphs.

After thorough prioritization and screening of more than 400 candidate subproject proposals in the INEEL Life Cycle Capital Plan, 10 capital project candidates qualified for meeting the objectives of the PEMP measure.

Table 1. Infrastructure Restoration/Optimization LICP: Sub-Projects.

PRIORITY 2 INFRASTRUCTURE	**TOTAL COST (escalated $K)**
CFA Substation High-Voltage Bus Upgrade	1,930
CPP-606 Service Building/Powerhouse Electrical, Mechanical, and Roof Upgrades	5,060
INTEC Utility Demineralization Upgrade	1,570
INTEC Emergency Communications Upgrade	14,730
INTEC Potable Water Upgrades	370
INTEC Fire Alarm Safety Upgrade	11,860
INEEL High-Voltage Equipment Replacements	30,380
INEEL Road System Upgrade	8,200
OPTIMIZATION MODIFICATIONS	
Modify INTEC Facilities to Accommodate Crafts and Warehouse Move from CFA	2,060
RESEARCH AND DEVELOPMENT MISSION PRIORITY	
IRC Laboratory Upgrades	2,643
GRAND TOTAL PROJECT COST	**$78,803**

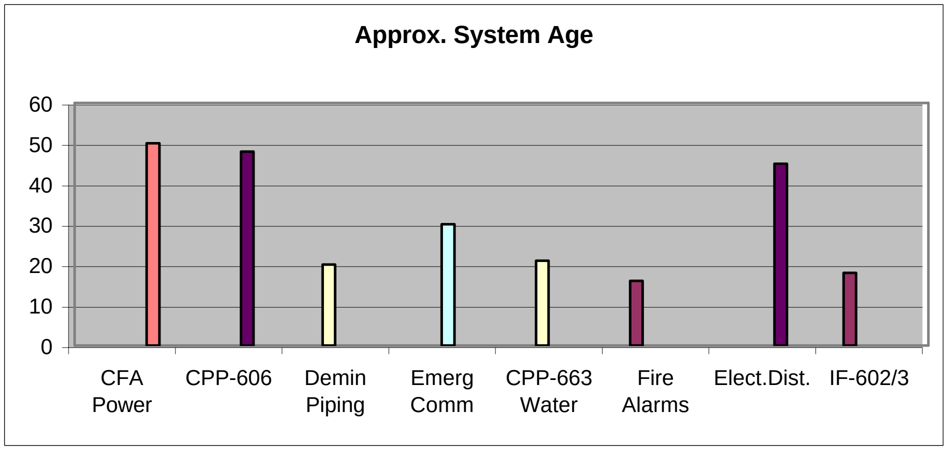


Figure 4. Approximate age of INEEL systems.

1.3.6 Problem Description of Selected Sub-Projects

CFA Substation High-Voltage Bus Upgrade—The high-voltage insulators and strain bus at the Scoville Substation are more than 50 years old, well beyond their normal life expectancy of 30 years (see Figure 5). The probability of failure increases constantly. Failure would impact the entire INEEL and depending on possible collateral damage could take many days to correct.

Figure 5. High-Voltage Insulators and Strain Bus at the Scoville Substation.

CPP-606 Powerhouse Upgrades—CPP-606 is a major support facility providing steam, plant air, and process water to many of the facilities and processes at INTEC that support the waste treatment and spent nuclear fuel missions. In FY 2000, new boilers were installed in the facility and the electrical service and main panels were replaced. The facility is over 40 years old and needs additional electrical, mechanical, and structural upgrades to reach its projected end of life in 2035. Specific upgrades include a new roof, interior electrical upgrades, heating and ventilation upgrades, and distribution system upgrades for steam, condensate, and process water. Failure to upgrade this facility and its distribution systems in an operable condition will cause operational impairments at INTEC jeopardizing mission milestones. The leaky and structurally unstable roof (Figure 6) is coated with an asbestos material that becomes friable from time to time, creating a serious health issue. Such exposures will undoubtedly increase over time.

Figure 6. Typical section of CPP-606 roof (asbestos layer sprayed on 40+ year-old corrugated asbestos panels).

INTEC Utility Demineralization Upgrade—The polyvinyl chloride (PVC) piping that is used to transport an average of 2,000 gallons per day of demineralized water throughout the utility tunnel is accelerating in deterioration (see Figure 7). The system lacks adequate hangers, expansion joints, and protection from water hammer. Because of this, major leaks erupt frequently. This creates safety issues and high maintenance costs and poses probable impacts to high-level waste and spent nuclear fuel programmatic operations.

Figure 7. Typical thermal expansion (snaking) of the PVC demineralization line.

INTEC Emergency Communications Upgrade—The existing system is made up of two separate older designs that have been modified over the years. Noncompliance and the lack of direct occupant notification for most INTEC buildings are serious concerns. Two failures last year lasted over 24 hours each time. Replacement parts are not available for most of the components and the entire system is unreliable. Serious employee risk exists from the likelihood of failure of these life safety systems. Maintenance on this system cost $79.5K in FY 2000.

INTEC Potable Water Upgrades—The CPP-663 facility has several potable water source/line noncompliance problems that present safety and health concerns.

INTEC Fire Alarm Safety Upgrade—The fire alarm safety system is not reliable, lacks spare parts availability, and does not provide a local annunciation of a fire alarm condition. The system must be updated to maintain a safe worker environment and to ensure that INTEC's mission is not jeopardized. The system is experiencing an increased frequency of failures. Noncompliance with five national life safety codes is a major concern. It costs $228K annually to keep the system operational. Specific upgrades are also needed for the fire water system to solve corroded component problems.

<u>INEEL High-Voltage Equipment Replacements and Upgrades</u>—This project replaces or upgrades 20- to 50-year-old major electrical equipment on the site electrical distribution system. Failure of these components will result in loss of electrical power to critical facilities onsite. The equipment requires long lead times to replace, and failure will result in extended operational impairments to individual facilities. Figure 8 shows leaking dielectric from a TRA transformer.

Figure 8. Leaking dielectric from TRA transformer.

Figure 9. Leaking dielectric from TRA transformer.

INEEL Road System Upgrades—Specific INEEL roads are essential to the movement of radioactive waste and spent nuclear fuel shipments.[5] Periodic upgrading of these transportation avenues is critical to maintaining capability in meeting State milestones and for safe shipments of these hazardous materials.

Modify INTEC Facilities to Accommodate Craft and Warehouse Consolidations—The elimination/inactivation of facilities on the INEEL will result in an overall cost reduction for the infrastructure program. Maintenance will not be necessary on these facilities and future upgrades can be eliminated. INTEC and TRA are two areas that have long-term missions and can be considered to be likely candidates to consolidate functions from other site areas, reducing the overall number of site facilities and utilities necessary to support future missions. Reduction of facility/utility systems at CFA is considered a high priority. Presently, CFA is the service and support center for programs located in surrounding areas. Some of these program missions are concluding and support services are diminishing. Investing in upgrades at INTEC will result in overall cost reductions for the INEEL's infrastructure budget.

INEEL Research Center Laboratory Upgrades—Corrosive fumes in the IF-603 fume hood exhaust system has caused considerable deterioration to the mild steel ductwork. The system service is marginal, as repairs are frequently required. The heating, ventilating, and air conditioning (HVAC) system in the IF-602 office building is not capable of satisfying the growing heat load, and the repair parts for the air handlers are no longer available through any source. Furthermore, the electrical distribution system is operating at capacity, has no room for growth, and does not meet current electrical codes and standards.

2. PRELIMINARY TECHNICAL PERFORMANCE REQUIREMENTS

Listed below are the preliminary technical performance requirements for each of the selected subprojects.

2.1 CFA High-Voltage Bus Upgrades

The following list details CFA high-voltage bus upgrades:

- One hundred fifteen insulators shall be replaced with commercially available having equivalent ratings
- Twenty-five hundred feet of static line shall be replaced with steel-reinforced cable having equivalent electrical ratings
- Five thousand feet of high-voltage bus cabling shall be replaced with copper cabling or bussing having equivalent electrical ratings.

2.2 CPP-606 Service Building/Power House Mechanical, Electrical, and Structural Upgrades

The CPP-606 upgrades shall be required to conform to the following requirements:

- Roof Upgrade
  - Repair of existing roof structure
    - The roof repair shall eliminate the release of friable asbestos fibers into the environment
    - The roof repair shall eliminate leaking around the roof penetrations.
  - Replacement of existing roof structure
    - The roof surface should be free of asbestos materials
    - The roof shall provide a solid barrier against leaks around the penetrating pipes/equipment
    - The roof and truss purlins shall be reinforced to support a more structurally sound roof that would accept the load of workers or future placement of equipment.
- Lighting and Electrical Circuits
  - The lighting levels shall be within the range recommended by the Illuminated Engineering Society (IES) Lighting Handbook for the application and location specified
  - The new electrical panels shall be commercially available with equivalent electrical ratings

  - All multibranch wire circuits (Edison circuits) shall be removed
  - All electrical circuits shall be modified to meet all applicable current codes and standards.

- Water Softener Controls
  - New, state of the art, water softener controls shall be installed to provide automatic operation of the water softener system
  - The new controls shall optimize the regeneration cycles of the water softeners in order to reduce the amount of sodium that is discharged to the service waste system
  - The new control system shall be capable of being monitored remotely from the consolidated utility control system (CUCS).

- Water Softener Piping
  - The water softener piping shall be replaced, as needed, to eliminate water leaks and prolong the life of this utility.

- Raw Water Pump Upgrade
  - The existing raw water pumps shall be replaced with new pumps that include variable frequency drives (VFDs) that can modulate with the changing loads placed on the raw water system
  - The raw water pumps shall be sized and selected according to actual loads placed on the raw water system
  - The new motor and VFDs shall be provided as a matched set to ensure proper operation
  - The new raw water pumping system shall be capable of being monitored remotely from the CUCS.

- Acid Tank Seismic Upgrade
  - The acid tank support system shall be upgraded to be compliant with current seismic codes and standards.

- Plant Air Receiver Upgrade
  - The existing, 50-year-old air receivers shall be replaced with new air receivers. The existing air receivers are approximately 1,000 gallons each.
  - The new air receivers shall include the necessary unfired pressure vessel stamps and accompanying manufacturer’s data report.

- Plant Air Piping Upgrade
  - The five air filters shall be upgraded to include a double isolation capability for each filter so that routine maintenance can be performed on the filters without the need for complete system outages.

- Ports shall be installed upstream of the two sets of filters for emergency connection of temporary air compressors in the event the existing air compressors need to be taken out of service. These ports shall include valves for double isolation.

2.3 INTEC Utility Demineralization Upgrades

The following list exemplifies INTEC utility demineralization upgrades:

- The installed demineralized water line shall supply all facilities that are currently served by the existing line.
- The installed line shall be stainless steel, 304-L Schedule 40 as a minimum.
- The installed line shall be sized to maintain a velocity of approximately 6 feet/second.
- The installed system shall include a recirculation loop. This shall circulate the water minimizing stagnant water and therefore maintain the purity level in the demineralized system.
- The installed system shall include expansion joints to minimize thermal expansion/contraction effects.
- The installed system shall utilize throttling techniques to minimize water hammer effects.
- Existing supports shall be used to the fullest extent as appropriate, although supports may need modification.
- New supports for the recirculation line shall be considered part of the scope of this work.

2.4 INTEC Emergency Communications Upgrades

The Emergency Communication System at INTEC shall be capable of notifying all habitable buildings via a voice notification system, fire alarm notification, and nuclear critically notification.

The Emergency Communication System shall be a supervised system and provide sound levels required by current standards.

2.5 INTEC Potable Water Upgrades

The following list details INTEC potable water upgrades:

- Separate water distribution systems are required in CPP-663—one for potable water usage and the other dedicated for industrial uses
- New piping shall be sized to maintain a velocity of approximately 6 feet/second

- Isolation valves shall be installed on all branch take-offs so individual systems can be shut down for maintenance without impacting other operations
- Identification of potable and non-potable water systems shall be accomplished per Section 601.2 of the Uniform Plumbing Code (UPC)
- After the upgrades have been completed, the potable water lines shall be disinfected per American Water Works Association, UPC, and INEEL site standards
- All safety showers shall be equipped with a hot and cold water-mixing device in order to deliver water at an appropriate temperature per American National Standards Institute (ANSI)-358.1998 standards
- Reutilization of existing piping systems shall be done as much as practical
- Piping supports shall be installed as necessary.

2.6 INTEC Fire Alarm Safety Upgrades

The fire alarm system shall provide notification to building occupants for evacuation.

The fire alarm system shall notify the CFA Fire Station of any fire alarm signal at INTEC.

2.7 INEEL High-Voltage Equipment Replacements

The following list contains details for INEEL high-voltage equipment replacements:

- Eighteen transformers shall be replaced with commercially available transformers of equal size and ratings
- Circuit breakers shall be replaced with equivalent functionality and approximately the same ratings
- One switchgear lineup shall be replaced with medium voltage class 15 kV-rated metal clad vacuum circuit breakers
- All transformers shall be liquid filled with environmentally friendly dielectric fluid
- The Supervisory Control and Data Acquisition (SCADA) shall be replaced with commercially available current technology that is capable of being integrated into the current hardware and software of the existing system.

2.8 INEEL Road System Upgrades

A recent inspection and investigation resulted in the following recommendation. Mitigate the deterioration of current transportation roadways and realize a cost saving through the institution of an upgrade program to stop costly long-term repairs. A successful upgrade program ensures the continuance and success of shipments critical to the daily activities of doing business on the site.

Figure 10. Timely reconstruction and chip/seal upgrades to limited roadways are necessary to support vehicle shipments of fuel and waste.

2.9 Crafts and Warehouse Consolidation

2.9.1 INEEL Craft Consolidation

The consolidation of craft resources, personnel, and equipment will achieve efficiency of function through elimination of redundant and duplicate operations and equipment and cost savings through elimination of additional maintenance, upkeep of both physical facilities and equipment, and facility overhead costs including utilities.

The selected facilities for the consolidation will require upgrades to utilities and some modifications to the physical structures to house tenants and accommodate relocated equipment.

2.9.2 INEEL Warehouse Consolidation

Existing buildings at INTEC that house similar functions were investigated for the optimization of space. The consolidation of the materials facilities will require minimal upgrades and modifications to already existing structures at INTEC. Modifications will require additional storage shelving, reconfiguration to achieve optimal storage efficiency, and relocation or excess of nonessential materials and items.

INTEC buildings CPP-1606 and CPP-1635 will require upgrades to the existing heating system or the installation of additional heating units.

Abandon CFA-674, excess warehouse, and provide approximately 35,000 ft^2 of alternate storage in CFA-601 for excess operations and offices for six personnel. Provide 6,500 ft^2 of space for PC redistribution operations including two offices. Provide networking capabilities to work areas and offices.

2.10 IRC Laboratory Upgrades

2.10.1 IF-603 Laboratory Exhaust System

The following list details IF-603 Laboratory exhaust system upgrades:

- The exhaust system shall safely transport fumes and vapors from the laboratory environments to a point outside of the building as well as the building air envelope.
- The heat recovery feature of the existing exhaust system shall be maintained so that effective preheating of the 100% outside air can continue.
- The exhaust system shall be constructed of a material that is resistant to corrosion in the presence of organic acids.
- The system shall transport the fumes/vapors outside of the building air envelope without the use of standard exhaust stacks.
- The exhaust system shall be designed as a completely negative pressure system. There shall be no positive pressure ducting inside of the facility.
- The new equipment installed shall be controlled and monitored by the existing direct digital control system.
- The exhaust system shall be designed to provide a pressure drop across the individual variable air volume. Phoenix valves of 0.6- to 3.0-in. water column. These valves are located directly above the fume hoods and laboratory modules. The Phoenix valve control system does not require modification.
- All of the new equipment shall be accessible for routine operations and maintenance activities.
- The nominal air volumes to be handled include:
  - Zone 2 11,450 cfm
  - Zone 3 18,760 cfm
  - Zone 4 45,000 cfm
  - Zone 5 8,280 cfm
  - Zone 6 18,000 cfm

2.10.2 IF-602 Office Building Fan Upgrade

The following list contains details for the IF-602 office building fan upgrade:

- The new fan and motor assemblies shall fit inside of the existing PACE air handler housings
- The new motor and VFDs shall be provided as a matched set to ensure proper operation
- The new equipment installed shall be controlled and monitored by the existing direct digital control system.

3. SCHEDULE AND MILESTONES

The schedule for the Infrastructure Restoration/Optimization Project uses a specific process (see Section 5.1) for Critical Decision authorization in order to allow construction to be initiated early in the project on specific tasks while design is being completed on the remaining tasks. Table 2 and Figure 11 presents the schedule for the project showing the concurrent design, construction, and startup activities and the Critical Decision milestones in order to permit this process to be accomplished. Conceptual design for the project will be performed in FY 2002 and 2003. The expenditure of capital funding for design will begin in FY 2004 with construction starting in FY 2005. Project closeout will occur in FY 2009.

Table 2. Project milestones and major phases.

Activity	Start	End
Critical Decision-0	—	2nd Q FY 2002
Project Data Sheet PED	—	3rd Q FY 2002
Conceptual Design	3rd Q FY 2002	3rd Q FY 2003
Project Data Sheet Construction	—	3rd Q FY 2003
Critical Decision-1	—	4th Q FY 2003
Definitive Design	1st Q FY 2004	2nd Q FY 2006
Critical Decision-2	—	4th Q FY 2004
Critical Decision-3	—	2nd Q FY 2005
Construction	3rd Q FY 2005	4th Q FY 2009
Critical Decision-4	—	3rd Q FY 2006
Startup	3rd Q FY 2006	4th Q FY 2009
Project Closeout	—	4th Q FY 2009

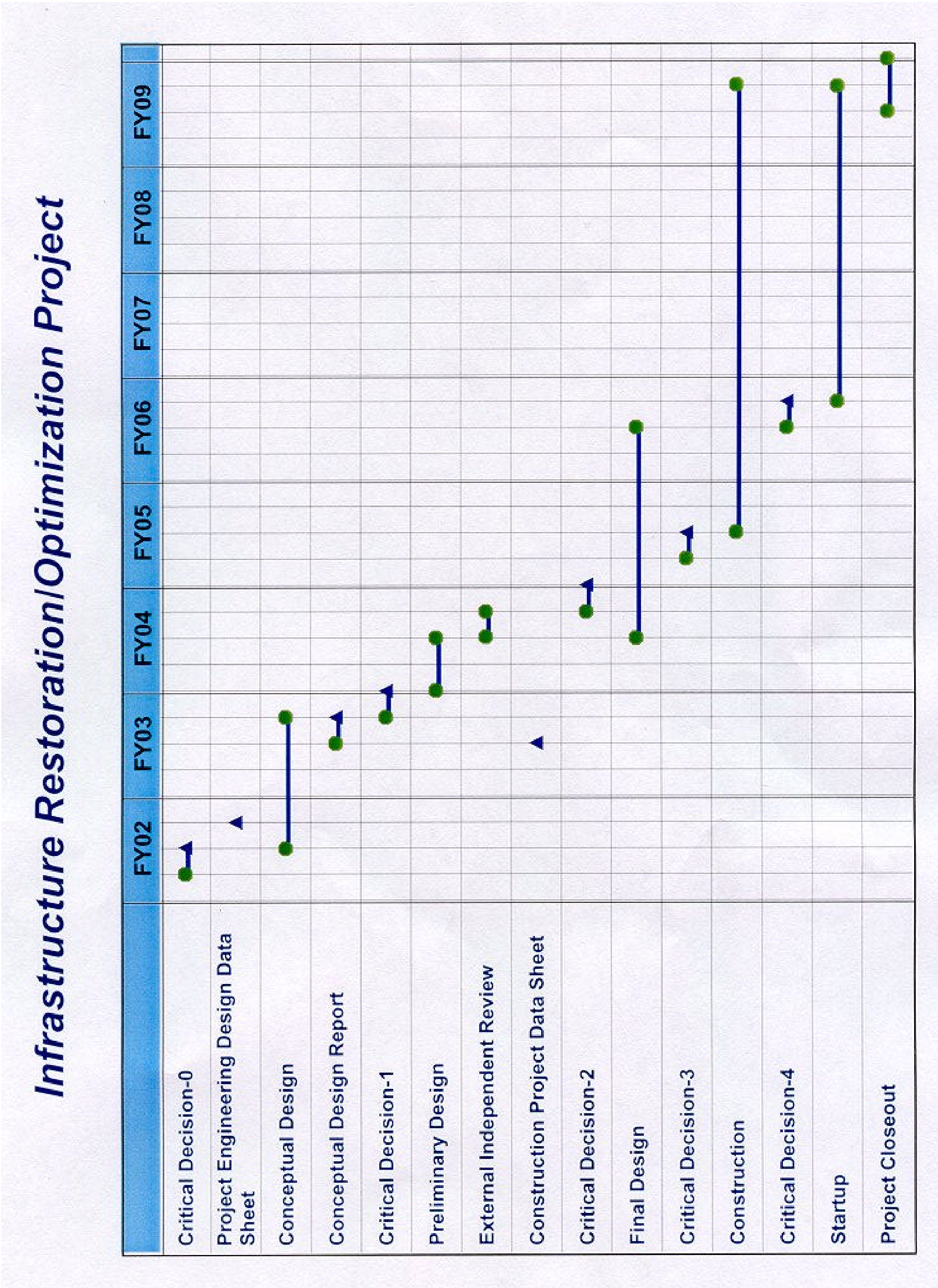


Figure 11. Proposed Project Schedule.

4. TOTAL PROJECT COST

The planning cost estimate for the INEEL Infrastructure Restoration/Optimization Project was based on the scope of work as defined in Section 2. Table 3 below shows the costs for the project broken down by major activity and the type of funding. Table 4 shows the funding by fiscal year. The costs in the tables below are based on a risk-adjusted planning cost estimate, using a confidence level of 65%.

Table 3. Project Funding ($K).

Activity	Subtotal ($K)	Total ($K)
Total Estimated Cost (TEC)		**$71,890**
Design Costs (Preliminary/Final)	$5,700	
Construction	58,849	
Construction Management	4,054	
Quality Assurance/Inspection	719	
Project Management	2,568	
Other Project Costs (OPC)		**$6,913**
Conceptual Design	$3,250	
Project Support	1,188	
Testing/Startup	2,475	
Total Project Cost (TPC)		**$78,803**

Table 4. Funding by Fiscal Year ($K).

TEC	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010
71,890	0	0	2,997	7,954	14,201	15,684	16,904	14,150	0
TPC									
78,803	1,250	2,000	3,215	8,392	14,928	16,609	17,689	14,720	0

5. ACQUISITION STRATEGY

The acquisition strategy for the INEEL Infrastructure Restoration/Optimization Project, to accomplish the acquisition of services to meet the project's objectives and goals, will utilize the M&O contractor for the INEEL. It is more efficient for the M&O contractor to schedule and perform the modifications to existing, operating facilities/utilities. The use of an outside contractor not familiar with the facilities, operation schedules, and procedures for scheduling and performing work on these facilities/utilities would be more costly and time consuming for the government.

It is more efficient for the M&O contractor to schedule and perform the modifications to existing, operating facilities/utilities.

5.1 Critical Decision Authorization

A simplified process will be used for design, construction, startup, and Critical Decision (CD) authorization due to the nature of this project (i.e., numerous small subprojects). Following completion of CD-1, *Approval of Preliminary Baseline*, the design, construction, startup, and CD approval processes will be performed in parallel. The construction project data sheet will be submitted prior to completion of the *Preliminary Design and Establishment of the Performance Baseline* (CD-2) to avoid delays between design and start of construction. Final design on some of the smaller subprojects will be early in the project schedule allowing construction to be initiated while other parts of the project are still in the design phase. Requiring this type of project to follow the standard process of completing a phase before beginning the next would create unnecessary delays and increase costs. CD-3, *Initiate Construction*, will be performed following completion of the first subproject design while design continues on the remainder of the subprojects. CD-4, *Commence Operations*, will be performed at the completion of construction of the first subproject while construction continues on the remainder of the subprojects. The project schedule shows this process.

A simplified process will be used for design, construction, startup, and Critical Decision authorization due to the nature of this project (i.e., numerous small subprojects).

5.2 Design Acquisition Strategy

The acquisition strategy for design is to use the M&O contractor's in-house Facilities Engineering organization to perform conceptual, preliminary, and final design for the modifications. The Infrastructure Restoration/Optimization Project is a diverse group of small projects covering many areas of the INEEL. The in-house engineering organization has sufficient personnel available that have the knowledge of the different site areas/facilities to eliminate the need for training new personnel or outside engineering organizations unfamiliar with the site. Engineering support during construction can also be provided more efficiently by the in-house engineering organization on an as-needed basis.

The acquisition strategy for design is to use the M&O contractor in-house Facilities Engineering organization to perform conceptual, preliminary, and final design for the modifications.

5.3 Construction Acquisition Strategy

Construction services will be obtained using fixed price subcontracts obtained through a bidding process for individual modifications or groups of modifications. Since the modifications are diverse in nature, subcontractors with specialty experience in specific disciplines will be used for each modification or group of similar modifications. The grouping of the modifications into smaller subcontracts also provides more flexibility in scheduling the construction work around operations and outage schedules.

Construction services will be obtained using fixed price subcontracts obtained through a bidding process for individual modifications or groups of modifications.

In some cases, direct-hire construction forces may be used to perform construction services. This generally occurs in older facilities where unknown radiological conditions exist, as-built conditions of the facility are not well defined, or the work scope cannot be well defined due to inaccessibility or excessive costs incurred defining facility conditions. In these instances, it is not economical to perform the work with fixed price subcontracts due to the large number of expected changed conditions that will occur over the construction period.

5.4 Startup/Testing Acquisition Strategy

M&O contractor operations and engineering personnel will perform startup testing.

6. PRELIMINARY RISK ASSESSMENT

A qualitative risk assessment was conducted for the overall project as well as each of the subprojects. The purpose of this assessment was to identify those risks that have the possibility of negating assumptions or criteria that form the basis for this project. A Risk Screening Checklist that identifies categories and criteria for risk consideration was used for the assessment to identify areas of risk. This checklist and the assigned risk levels are included in the CD-0 document.

Risks were categorized on the checklist as high, medium, or low. The strategy for management of all areas that are categorized as low is to monitor activities pertaining to these areas as the project progresses to ensure that the risk does not escalate. Management of the categories in the low range will use standard cost and schedule contingencies in the baselines to mitigate effects from them.

Two areas were identified with *high* risks. The first of these is the failure to fund either one or both of the line items for the proposed new Site Engineering and Resource Facility and the INEEL Consolidated Laboratory LICPs. The Infrastructure Restoration/Optimization project assumes that upgrades are not required for existing office or laboratory facilities. Failure to fund the two other projects could cause this project to be under-scoped, and sufficient funding would not be available to meet any additional high priority out-year infrastructure restoration needs. The project will track the progress of the two projects. As success in obtaining funding for the two projects becomes more clearly defined, actions will be taken to expand the scope of this project (if necessary).

The use of GPP and other line-item projects could be used to upgrade facilities if the new Site Engineering and Resource Facility or INEEL Consolidated Laboratory is not funded. Monitoring the progress of the two other project proposals will provide early awareness of funding problems, which would allow the use of separate capital requests to be explored before any impacts would occur.

The other *high* risk is the CFA High-Voltage Bus Upgrade subproject. It will affect all INEEL facilities and the towns of Arco and Howe. This introduces numerous key participants and interfaces that can limit or delay planned electrical outages to replace this equipment. Significant planning will be required to ensure that minimum impact will occur to areas served by the high-voltage bus. Risk mitigation for this subproject will focus on reducing the consequences resulting from a power outage and the number of interfaces affected by the outage. The planning may include designs to provide alternate power in some cases as well as identification of time periods where power outages will have a minimum impact. Tools such as value engineering will be used early in the process to identify alternate paths to complete the upgrade. Schedule and cost contingencies for this subproject have been adjusted accordingly for the identified risk.

The *medium* risk categories are contained in the CD-0 document. These risks have potential impact to the project, but are considered to be manageable with proper planning and monitoring to ensure they do not escalate. The risks will be monitored during project execution and status provided at critical decision points.

7. COST SAVINGS OPPORTUNITIES

The infrastructure optimization opportunity portion of this LICP provides significant utilities and maintenance cost savings through consolidation coupled with the inactivation of the unneeded facilities and systems.

The infrastructure optimization opportunity portion of this LICP provides significant utilities and maintenance cost savings through consolidation coupled with the inactivation of the unneeded facilities and systems. In addition, there would be substantial avoided costs for the life-cycle capital needs that were planned for these vacated facilities. The other subprojects mitigate mission-critical, environmental, safety and health issues and contribute to significant avoided costs in lost productive time, government fines, and accident-related costs. However, it is difficult to estimate such cost savings. In addition, if upgrades are deferred, aging and deterioration will continue and tend to increase the future repair/restoration costs. Collectively, the subprojects contribute toward reducing the gap between expected out-year funding allocations and projected life cycle funding needs.

7.1 Maintenance and Utilities Cost Savings

With the proposed relocation of craft workers and warehousing from CFA to INTEC, the following buildings/systems could be vacated and inactivated:

- CFA-601 Warehouse (partial closure)
- CFA-621 Multi-Craft Shop #1
- CFA-622 Multi-Craft Shop #2
- CFA-623 Multi-Craft Shop #3
- CFA-624 Multi-Craft Shop #4
- CFA-660 Laborer/Equipment Operations Building
- CFA-661 Materials Storage Building
- CFA-664 Storage Building
- CFA-671 Boiler House
- CFA-674 Warehouse
- CFA-684 Flammable Storage
- CFA-695 Fire Safety Equipment Storage
- CFA-697 Equipment Storage
- Utilities CFA-671 Steam System
- Utilities Emergency Notification System (partial)
- Utilities Fire Water System (partial)
- Utilities Fire Alarm System (partial).

Unit maintenance costs for CFA buildings are approximately $14 per square foot. Because headcount would be reduced, the actual cost savings from deliberate inactivation of buildings would approximate this unit cost. In the proposed CFA facility closures, this computes to ($\$14/ft^2 \times 145{,}982\ ft^2$) $2,043,748 annually. And given that the relocation would happen in 2007, or 40 years prior to the normally expected end date of 2047, then the life-cycle maintenance savings for closing these buildings so early would be $81,749,920.

In this analysis, utilities are defined as steam heating from CFA-671 and electric power. The current adjusted annual power cost is $1.56 per square foot of CFA footprint. This includes electric power distribution maintenance and with a subsequent manpower reduction computes to $228K saved annually. Air conditioning expenses are included in the electric costs. Shutting down the steam system would save 60,000 gallons of fuel annually and, coupled with reduced operating and maintenance manpower, would total approximately $245K minimum in savings per year (Figure 12). Although not quantified, potable water and sewer costs are considered negligible in this analysis.

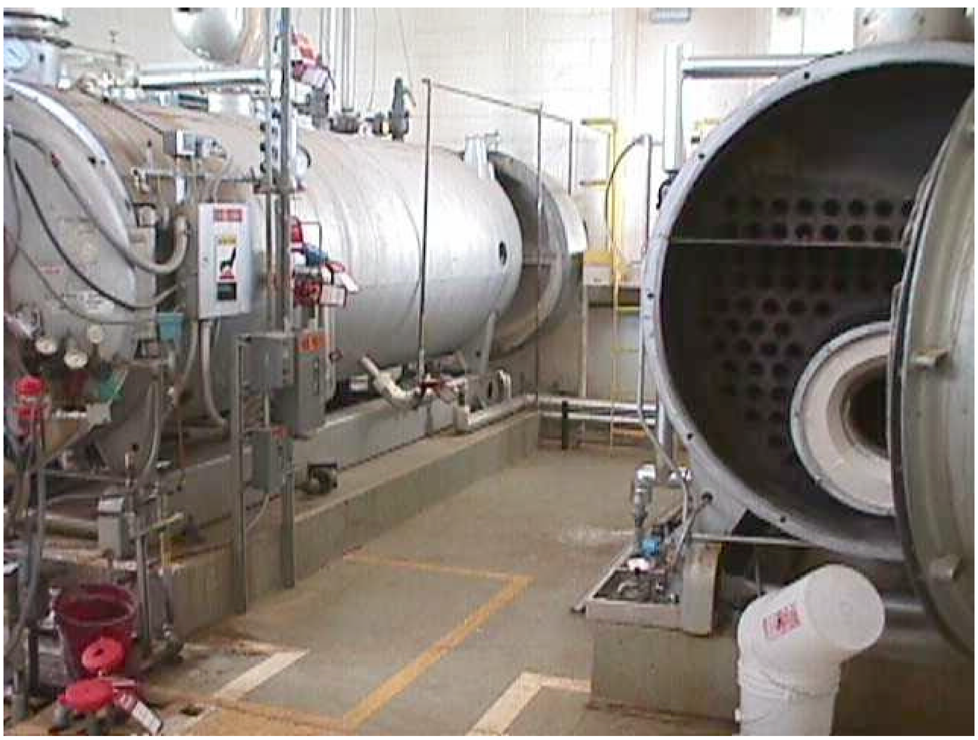


Figure 12. CFA-671 boilers (shown here undergoing summertime preventative maintenance) would be inactivated saving approximately $245K annually.

7.2 Cost Avoidance

The total life-cycle capital costs for the infrastructure previously listed above were estimated at $27.2M in the *INEEL Life Cycle Capital Plan* through FY 2010. With the relocation of functions and the inactivation of those facilities, all such costs would be avoided in this proposal (see Appendix A).

In addition, there are expected indeterminate avoided costs for the other nine subprojects by virtue of the installed upgrades reducing or eliminating the various environmental, safety, and health risks. For example, failure of the incoming electrical bus at CFA or any of the major listed transformers could shut down any or all areas unexpectedly and create immediate dangers for employees.

7.3 Narrowing the Funding Gap

The Executive Summary of the *INEEL Infrastructure Long-Range Plan* presents a Gap Analysis wherein the life-cycle costs (including capital, maintenance, and D&D) are compared to expected funding levels. As demonstrated above, the life-cycle capital needs are extensive; consequently, the gap is significant with the expected flat funding. This funding issue may be partially resolved by consolidating many of the INEEL infrastructure needs.

The primary objectives of this LICP development are (1) to upgrade high-priority infrastructure needs for important missions and (2) to effect opportunities to relocate/consolidate support functions, thereby avoiding life-cycle costs while optimizing operating and maintenance costs.

The primary objectives of this LICP development are (1) to upgrade high-priority infrastructure needs for important missions and (2) to effect opportunities to relocate/consolidate support functions, thereby avoiding life-cycle costs while optimizing operating and maintenance costs.

Both actions will effectively reduce the funding gap between life-cycle capital needs and expected capital funding levels. While neglecting indeterminate Surveillance and Maintenance savings, operating cost savings, and mitigated environmental, safety and health (ES&H) impacts, this benefit is still calculated as a significant factor:

$$\%\text{ Gap Reduction} = \frac{\text{LICP \$78.8M + Avoided Life-Cycle Costs of \$27.2M}}{\text{FY 2010 Cumulative Capital Gap of \$693M}} = 15\%$$

In the formula above, the numerator is a small part of the total INEEL infrastructure needed during the next 10 years. Here, the $27.2M is life-cycle capital needs through FY 2010 that is no longer required when the $78.8M is invested. They are also components of the cumulative capital gap; thus, implementing the LICP reduces the cumulative capital gap in FY 2010 by $106M, or 15%.

In addition, if the prioritization process were employed to decide NOT to invest in life-cycle capital upgrades for that lower priority infrastructure, then the gap would be reduced even more dramatically. However, these items are not totaled and added to the above reduction, because they are not a function or benefit derived from the LICP.

7.4 Cost Savings Summary

Table 5 shows the savings that would be realized from the implementation of the craft and warehouse consolidation proposal. The life-cycle savings (non-escalated) assume that the life cycle of the CFA mission extends to the year 2047. Note that the dollar value in the CFA Life Cycle Maintenance and Utilities Savings column would not necessarily be realized, but is shown here to signify the magnitude of the opportunity.

Table 5. Cost Savings.

Annual Maintenance Savings	Annual Identified Utility Savings	Total Annual Maintenance and Utility Savings	CFA Life Cycle Maintenance and Utility Savings Potential
$2,044K	$473K	$2,517K	$115,782K

Table 6 shows the effects from the implementation for most of the subproject proposals. The life cycle of the CFA mission extends to the year 2047. The avoided costs (nonescalated) for the Craft and Warehousing Consolidation subproject are captured from the *INEEL Infrastructure Long-Range Plan*. All of the other entries are financially indeterminate, but are applicable to mitigating environmental, safety, and health risks.

Table 6. Avoided Costs and Mitigated ES&H Risks/Impacts.

Subproject	Avoided Life Cycle Capital Costs	Mitigated Environmental Risk/Impact	Mitigated Safety Risk/Impact	Mitigated Health Risk/Impact
CFA Substation Bus	–	Yes	Yes	–
CPP-606 Upgrades	–	Yes	Yes	Yes
INTEC Demineralized Water	–	Yes	Yes	–
INTEC Emergency Communications	–	Yes	Yes	–
INTEC Potable Water	–	–	–	Yes
INTEC Fire Alarm	–	Yes	Yes	–
High-Voltage Equipment	–	Yes	Yes	–
Road System	–	Yes	Yes	–
Craft/Warehouse Consolidation	$45,702K	–	–	–
IRC Lab Upgrades	–	Yes	Yes	Yes

8. PRELIMINARY NEPA AND PERMITTING STRATEGY

During the conceptual design phase, an Environmental Checklist (EC) will be prepared for all portions of the project and submitted to the Environmental Affairs department for determination of the required environmental evaluations and permits necessary to complete the project. It is expected that the majority, if not all, of the project will be covered by a Categorical Exclusion based on preventative maintenance and safety and health improvements to the work place. If replacement facilities are required, an Environmental Assessment will be prepared (if necessary).

Environmental Affairs as part of the EC process will identify required permitting. It is expected that actions will be required for asbestos abatement, storm water pollution prevention, Resource Conservation and Recovery Act permit reviews, soil disturbances, potable water modifications, culture resource clearances, and other related permits. There are no new air emission sources; however, modifications will be performed to the INEEL Research Center (IRC) Laboratory fume hoods' exhaust system requiring a review of the existing permit. This will be identified on the EC and appropriate actions assigned.

9. PROJECT TECHNICAL AND ORGANIZATIONAL INTERFACES

The Infrastructure Restoration/Optimization Project is closely tied to the INEEL Consolidated Laboratory Project proposals. The infrastructure upgrades to be performed by this project assume that numerous facilities at various site locations will no longer be occupied because the occupants and functions have been transferred to the new laboratory buildings. Therefore, future upgrades are not required in these abandoned facilities and they can be inactivated—reducing future upgrade, maintenance, and operations costs (inactivation costs will be borne by the tenant group or landlord). Failure to fund the other project could have an impact on the scope of work needed for this project to ensure adequate upgrades are being funded for the existing high priority INEEL infrastructure.

With the completion of the consolidated laboratory, and relocation of crafts and warehousing to INTEC, the majority of facilities along with their utility systems at CFA would be inactivated. The project assumes that only the CFA-601 warehouse, CFA-609 Security Headquarters, CFA-663 Core Storage Library, CFA-668 Communications Building, CFA-681 Substation Control House, CFA-696 Transportation Complex, CFA-698 Standards and Calibration Laboratory, CFA-1611 Fire Station, CFA-1612 CFA Medical Facility, CFA-1614 Fire Training Facility, and CFA-1618 Health Physics Instrument Laboratory Replacement will remain in operation. Some utility systems such as the water wells and pumps, firewater pumps, sewage facilities, and fueling stations will also remain in service.

The Infrastructure Restoration/Optimization Project is closely tied to the INEEL Consolidated Laboratory Project and the Site Engineering and Resource Facility proposals. Failure to fund the other two projects could have an impact on the scope of work needed for the Infrastructure Restoration/Optimization Project to ensure adequate upgrades are being funded for the existing high priority INEEL infrastructure.

The Infrastructure Restoration/Optimization Project assumes that TAN-TSF and WROC areas will be shutdown and no upgrades will be required in these areas. It is assumed that the RWMC will be operated by others and no future upgrades need to be planned in this area. This project will be responsible to provide priority upgrades for site-wide utility systems that supply these areas where operations will still be performed by others, such as the RWMC and SMC.

The proposed FY 2004 General Plant Project to upgrade CPP-1636 and CPP-1637 for craft shops is assumed to have been approved and completed. The consolidation of craft and maintenance personnel from CFA as part of this project will utilize portions of these facilities and no funding is included to upgrade them. The project assumes with the diminishing missions for areas supported by CFA crafts (such as WROC and RWMC) and the closure of most of CFA facilities and supporting utilities, a significant reduction in the number of craft personnel from CFA will occur. The craft consolidation at INTEC assumes that only approximately 80 craft, management, and support personnel will be moved to the facilities at INTEC.

The proposed consolidation of warehousing at INTEC assumes that with the diminishing mission for CFA and areas supported by CFA, the need for warehouse space will decrease accordingly. The current 50,000 ft^2 of warehousing at CFA-601 would be reduced to 26,000 ft^2 needed at INTEC. The CFA-601 facility would be used to house the site excess operations while the existing CFA-674 facility will be inactivated.

10. ISSUES

Many issues, constraints, and uncertainties surfaced while performing the various steps for the LICP development.

1. The Performance Evaluation Measurement Plan measure was assigned at the beginning of the fiscal year. In April 2001, however, it was announced that the INEEL workforce would be reduced by 1,200 employees by FY 2002. EM funding could be reduced resulting in even more workforce reductions. It may be late in the current fiscal year before the final decisions are determined. The employee population reduction will create opportunities to abandon and close high-cost facilities, terminate leases, and consolidate selected activities. Such uncertain changes in infrastructure needs seriously influence the details of the response to the PEMP measure. These uncertainties may not be resolved until next fiscal year, and thus a recommendation cannot be presented that would fit the uncertain future. Therefore, the resulting recommendations abide by the PEMP measure, but it also suggests that a new assignment for FY 2002 be developed to reassess the infrastructure plans.

2. In formulating the criteria for identifying the scope for this LICP submittal, a methodology had to be developed, tested, and agreed upon to prioritize the more than 400 infrastructure life-cycle needs that were listed in the *INEEL Infrastructure Long-Range Plan* between fiscal years 2004 and 2010. Each of the area planners was included in the process, and they reviewed the team's selection list with their respective Site Area Director's Landlord. Thus, the list of subprojects was accomplished multilaterally with the responsible stakeholders. However, in a few areas at INTEC, the responsibility between landlords and programs is not perfectly clear. Thus, some program people could raise an issue that some of their perceived infrastructure needs, such as a process-related HVAC system, are not included in this LICP. Any such mission requirement/issue will not go away, but they can be resolved with a future GPP request written by the designated responsible party.

3. Environmental, safety, and health considerations weighed heavily in bringing many of the subprojects to the forefront. For example, a failure of the high-voltage bus at the CFA substation or any of the other high-voltage equipment could seriously jeopardize life safety systems around the INEEL site. Similarly, the INTEC emergency communications, fire alarm safety, and potable water upgrades certainly impact the level of safety and health issues. In addition, the INEEL road upgrade is a high priority because of its importance to the safe transportation of spent fuel and other waste. The necessary upgrades may require four or more years to implement.

4. Removal of the CPP-606 roof will be an extremely difficult task. The original roof material is transite, which is a corrugated, pressed asbestos product. Normally, this material can be handled with care to prevent the asbestos from becoming friable. However, at some time in the past, a layer

of asbestos was sprayed on top of the transite. Upon removal, this overcoat has the potential to become easily friable and thus will have to be tented from above with a negative applied pressure to prevent emissions to the atmosphere. Preventing airborne emissions into the building below will be technically difficult and costly. The alternative analysis part of the conceptual design phase may reveal that such work is too much of a health risk. This building is crucial to providing steam, compressed air, and demineralized water to INTEC, which compounds the issue.

5. Upgrading the antiquated CFA Substation feeder bus/insulators will involve an electrical outage that will deenergize the surrounding small towns, as well as the entire INEEL site. Precise plans will need to be developed and deployed to minimize the outage time and mitigate adverse effects of such a widespread power curtailment.

11. CONCLUSIONS AND RECOMMENDATIONS

For each of the subprojects, alternative solutions were generated, studied, and evaluated. That detail is discussed in the CD-0 document. The subsections below show the conclusions and recommendations for each of the subproject evaluations. Details of the alternative analyses are presented in Appendix E.

11.1 CFA High-Voltage Bus Upgrade

The likely cost-effective alternative is to replace the CFA high-voltage bus and insulators. Other alternatives were generalized and evaluated. Details are included in Appendix E and the CD-0 document. In addition, selling the INEEL electrical power distribution system to a power company is a possibility that will be pursued during the conceptual design.

The design phase would select the appropriate high-voltage bus insulator for the application and location. An example of an insulator would be Veri*Lite made by Ohio Brass. The design phase shall include the required outage to replace some of the insulators where they are in proximity to other energized buses. In addition, the strain bus and required mechanical connections will be replaced with a modern design consisting of a combination of rigid and strain bus. The construction phase would consist of procurement and installation of the new insulator and strain bus. The subcontractor would be required to work closely with the Operating Contractor due to the complexity of the required outage. Manufacturer-recommended testing and other applicable INEEL Power Management testing requirements would be performed before the high-voltage bus is released for operation.

11.2 CPP-606 Mechanical/Electrical/Structural Upgrades

11.2.1 Lighting and Electrical Circuits

The likely cost-effective alternative for correction of the electrical deficiencies in CPP-606 is replacement of the required wiring, panel boards, and lighting. Other alternatives were generated and evaluated. Details are included in Appendix E and the CD-0 document.

A field survey will be required to identify which panel boards need to be replaced. A field survey will also be required to determine the feasibility and location of routing new raceways throughout the facility to replace the old wiring. New lighting designs can be provided by the vendor. Vendor software can identify where and how much lighting to install as recommended by IES.

Construction would install the lighting as recommended by the manufacturer and as required by contract drawings/documents. Construction would replace panel boards and wiring as specified.

11.2.2 Water Softener Controls

The likely cost-effective alternative is to upgrade the control system to current day technology. Other alternatives were generated and evaluated. Details are included in Appendix E and the CD-0 document.

11.2.3 Water Softener Piping Upgrade

The likely cost-effective alternative is to replace the piping. Other alternatives were generated and evaluated. Details are included in Appendix E and the CD-0 document.

11.2.4 Raw Water Pumps

The likely cost-effective alternative is to upgrade the raw water pumping system. Other alternatives were generated and evaluated. Details are included in Appendix E and the CD-0 document.

11.2.5 Acid Tank Seismic Upgrade

The likely cost-effective alternative is to modify the structural supports. Other alternatives were generated and evaluated. Details are included in Appendix E and the CD-0 document.

11.2.6 Upgrade of Plant Air Receivers

The likely alternative is to upgrade the air receivers. Other alternatives were generated and evaluated. Details are included in Appendix E and the CD-0 document.

11.2.7 Upgrade Plant Air Piping

The likely cost-effective alternative is to upgrade the plant air piping to include double isolation valves for the filters and install emergency connection ports upstream of the filters. Other alternatives were generated and evaluated. Details are included in Appendix E and the CD-0 document.

11.2.8 Roof Upgrade

The likely cost-effective alternative is to remove the old roof and install a new roof system. Other alternatives were generated and evaluated. Details are included in Appendix and the CD-0 document.

11.3 INTEC Utility Demineralization Upgrades

It is recommended that the 3-in. PVC line be replaced with stainless steel. The system delivers 2,000 gallons per day to five facilities. The project drastically reduces maintenance costs and potential safety hazards. Other alternatives were generated and evaluated. Details are included in Appendix E and the CD-0 document. The new system shall supply all current facilities served by the existing line. A recirculation loop shall be incorporated into the design of the demineralized water system. This shall circulate the water, minimizing stagnant water, and therefore maintain the purity level in the demineralized system. Expansion joints shall be incorporated into the pipe system to minimize thermal expansion/contraction effects. Throttling valves shall be used to minimize water hammer effects. Existing supports shall be used as appropriate, although existing supports may need modification. New supports for the recirculation line shall be considered part of the scope of this work.

11.4 INTEC Emergency Communications Upgrades

The general work scope for replacement of the Emergency Communication System (ECS) and Voice Paging System (VPS) would consist of the following. Other alternatives were generated and evaluated. Details are included in Appendix E and the CD-0 document.

- Study availability of equipment meeting the specific need of INTEC
- Study reuse of existing verses installing new wiring in the new system
- Design Phase (Conceptual, Title I, Title II)
- Construction Phase and Title III Support
- Fire Alarm Panel Outage preparation
- Installation and testing
- Turnover and close out.

Occupant notification, a fire watch, and restriction of activities would be necessary during ECS and VPS outages (during installation). Based on the specific type and model of ECS and VPS selected, the use of existing wiring and fiber optics versus installing new wiring would be evaluated.

11.5 INTEC Potable Water Upgrade

The cost-effective alternative is to connect the existing system to the industrial water source located in the adjacent utility tunnel and plumb a 2-in. line from the existing potable water source to the showers, restroom sinks, safety showers/eyewashes, and drinking fountains. Re-label the potable and industrial water lines, as necessary. Other alternatives were generated and evaluated. Details are included in Appendix E and the CD-0 document.

This is also a viable option and would place CPP-663 in compliance with respect to current regulatory drivers. This would eliminate any certification and testing of backflow prevention devices and reduce the risk of future tie-ins that do not meet current standards.

Along with any option, the treated water (demineralized) must be separated from the potable water. This is not only a cross contamination issue, but the potable water piping (carbon steel) is severely degraded by the presence of demineralized water.

Also, per ANSI 358.1-1998, all safety showers and eyewashes shall be installed with thermostatic mixing valves rated for use with safety showers.

With any option, all of the current pipe labeling should be removed and new labeling placed on the piping after the system has been fully upgraded to meet the required standards.

11.6 INTEC Fire Alarm Safety Upgrade

The general work scope for replacement of the fire alarm system would consist of the following. Other alternatives were generated and evaluated. Details are included in Appendix E and the CD-0 document.

- Study availability of equipment meeting the specific needs of INTEC
- Study the existing methods of wiring for reuse in the new system
- Design Phase (Conceptual, Title I, Title II)
- Construction Phase and Title III Support
- Fire Alarm Panel Outage preparation
- Installation and testing
- Turnover and close out.

Occupant notification, a fire watch, and restriction of activities will be performed during fire alarm panel outages (during installation). Based on the specific type and model of fire panel selected, the use of existing wiring and fiber optics will be evaluated to the feasibility of reusing verses installing new wiring.

11.7 INEEL High-Voltage Equipment Replacement

The likely cost-effective alternative is to replace the existing INEEL high-voltage equipment. Other alternatives were generated and evaluated. Details are included in Appendix E and the CD-0 document. In addition, selling the INEEL electrical power distribution system to a power company is a possibility that will be pursued during the conceptual design. This is based on cost, engineering, outage minimization, and increased reliability. New transformers, circuit breakers, and switchgear come with a warranty that exceeds the warranty for a rebuilt unit. In order for the INEEL high-voltage transmission system to be functional to its scheduled date based on the *INEEL Infrastructure Long-Range Plan*, new equipment has to be installed and utilized to provide the required service life.

The design phase would select the appropriate high-voltage equipment based on current and future needs of the facility. Existing ratings of the piece of equipment will be used as a baseline. Engineering will integrate the new equipment with existing pads and structures for ease of installation. Both the operating contractor and the subcontractor will develop an outage plan to minimize duration and complexity of the outage. The construction phase would consist of procuring and installing the equipment. Manufacturer-recommended testing and other applicable INEEL Power Management testing requirements would be performed before the high-voltage equipment is released for operation.

11.8 INEEL Road System Upgrade

It is recommended that the roadways identified for mission-critical transportation routes be upgraded per the FY 2000 *Paver Report*. Upgrades to these INEEL mission-critical roadways will ensure the continued successful shipments within the site complex. Other alternatives were generated and evaluated. Details are included in Appendix E and the CD-0 document.

11.9 INEEL Crafts and Warehouse Consolidation

11.9.1 INEEL Crafts Consolidation

The selected alternative shall be to integrate CFA painters, electricians, mechanics, pipe fitters, and carpenters at INTEC in the CPP-663, CPP-1636, and CPP-1637 buildings; the functional teams in CPP-663 and CPP-697; the work control and management function in CPP-663; equipment operators, laborers, and roads/ground equipment in CPP-1653; and the power management function in CPP-1653. Other alternatives were generated and evaluated. Details are included in the CD-0 document. Figure 13 shows how craft personnel will be consolidated from CFA to INTEC. In addition, Table 7 shows cost-effective alternative craft locations and numbers.

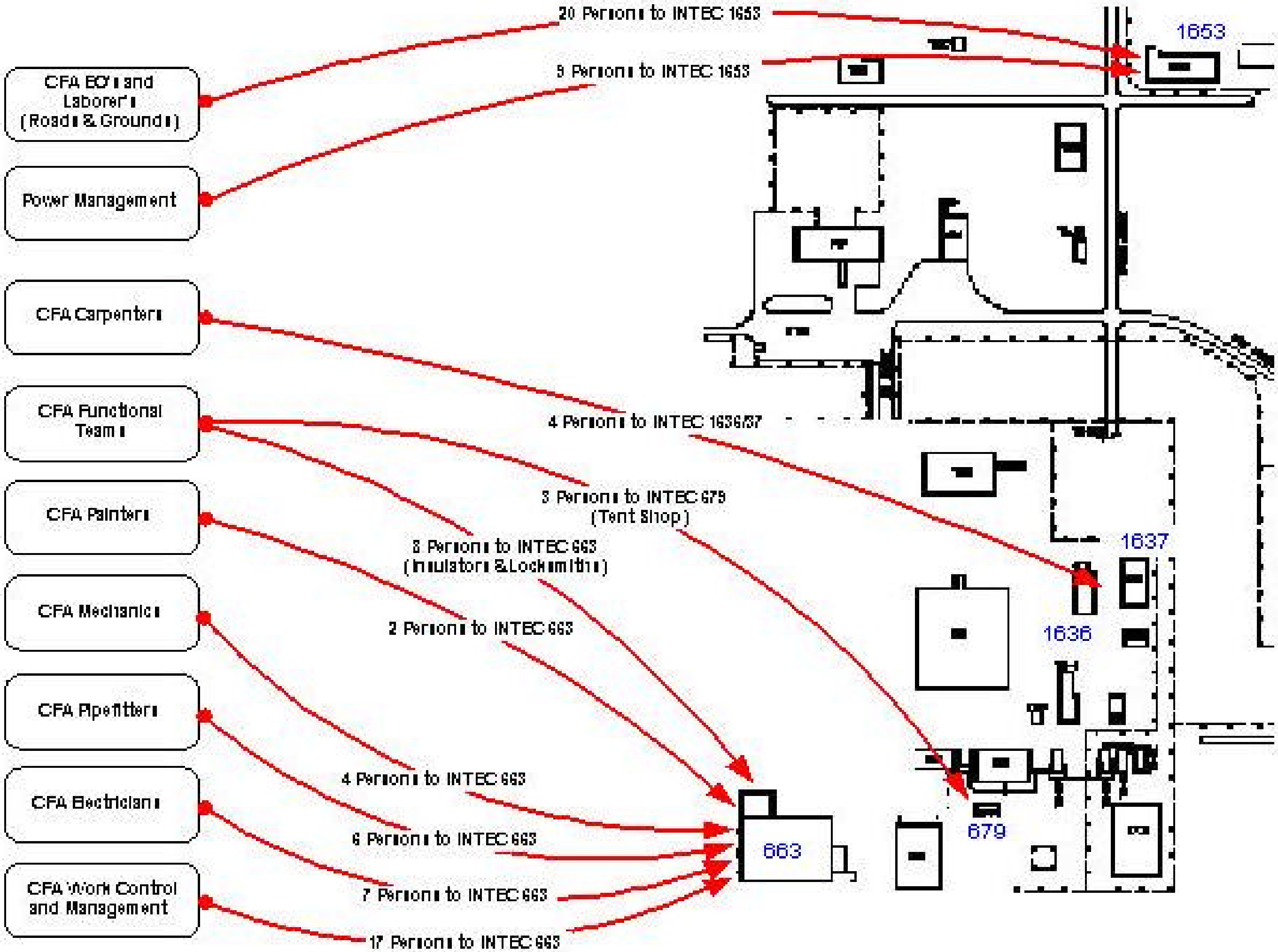


Figure 13. INEEL Infrastructure Restoration LICP – Craft Personnel Move from CFA.

Table7. Cost-Effective Alternative Craft Locations and Numbers.

Group	Preferred Location	Personnel	Required Area	Additional Requirements
Work Control and Management	CPP-663	17	100-ft^2 file room	–
Power Management	CPP-1653	9	5,000 to 7,000-ft^2	5 garage stalls
Equipment operators/ Laborers (Roads and Grounds)	CPP-1653	20	1,500-ft^2 muster area 5,000-ft^2 garage area 1,500-ft^2 inside material storage	Outside work area equivalent to around CFA-660 Outside parking for 17 vehicles 12 large and 15 small pieces of equipment
Functional Teams	INTEC-697 and -663	11	1,250-ft^2 shop 100-ft^2 secure storage area	Parking for 5 vehicles Sling testing Hoisting/rigging van
Painters	INTEC-663	2	500-ft^2 for sign machine	Parking for 1 vehicle
Electricians	INTEC-663	7	500-ft^2 shop	Parking for 3 vehicles
Mechanics	INTEC-663	4	350-ft^2 shop 50-ft^2 chemical storage	Parking for 2 vehicles
Pipe fitters	INTEC-663	6	500-ft^2 shop	Parking for 3 vehicles
Carpenters	INTEC-1636 or -1637	4	2,500-ft^2 combined tent/carpenter 400-ft^2 material storage	Parking for 2 vehicles Scaffolding trailer, saws, bander, jointer

11.9.2 INEEL Warehouse Consolidation

The selected alternative shall be to make the upgrades to INTEC-654, -660, -1606, and -1635 and CFA-601 and proceed with the proposed consolidation. Other alternatives were generated and evaluated. Details are included in the CD-0 document. The scope would entail a planning and implementation phase for the heating upgrades to INTEC-1606, INTEC-1635, and CFA-601. The relocation of warehouse items should be included in the appropriate yearly operational budget forecasts.

11.10 IRC Laboratory Upgrades

The likely cost-effective alternatives for each phase of this project are listed below. Other alternatives were generated and evaluated. Details are included in Appendix E and the CD-0 document.

- IF-603 Laboratory Exhaust System:

  Realizing that the actual scope of work may change as more data are obtained, the likely alternative, at this time, is to proceed with a complete replacement of the fume hood exhaust system from the individual fume hoods to the exterior of the facility.

- IF-602 Office Building HVAC Upgrade:

The likely cost-effective alternative is to upgrade the fan and motor assemblies to include VFDs. In order to obtain the optimum equipment for this type of application, both the motors and the fan assemblies will be replaced. The direct digital control system will need to be modified to continue to control and monitor the operation of these fans. The frequent equipment repairs will be eliminated and a considerable amount of energy will be saved by better use of electrical energy due to the installation of VFDs. Figure 14 shows IRC office and lab buildings.

Figure 14. IRC Office and Lab Buildings.

- IF-602 Office Building Cooling Capacity Upgrade:

The cost-effective alternative is to provide additional cooling to effectively chill the well water being sent to the two air handlers. The well water supply line will need to be intercepted prior to the air handler cooling coils so that additional cooling of the water can be performed. An existing equipment support platform on the roof of the facility can be utilized to mount the needed equipment. In order to chill the well water an additional 5°F, a chiller with a capacity of ~65 tons of cooling will be required.

- Office building electrical upgrade:

The cost-effective alternative is to install increased capacity for distribution panels and correct electrical codes and standards violations. Installation of two new transformers at the second and third floor, each feeding 2 new 3-phase 208/120 VAC distribution panels, would reduce load on the main 300-kVA transformer and provide capacity for growth and expansion. In order to comply with the National Electric Code and DOE-ID Architectural/Engineering Standard, each conduit feeding a load will have to be checked for conduit fill and sized accordingly. Installing a separate ground conductor for each circuit will also be required. Use of pull-by's or re-pulling wire in existing conduits would be required. A field survey will be required to identify selection of equipment locations. A load study would be required to correctly size the new transformers and distribution panels.

12. REFERENCES

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6. IEEE Guide for Reporting Failure Data for Power Transformers and Shunt Reactors on Electric Utility Power Systems, ANSI/IEEE C57.117-1986.

7. U.S. Department of Energy, *ORDER DOE O 413.3 Program and Project Management for the Acquisition of Capital Assets,* October 2000.

Appendix A

Avoided Infrastructure Life-Cycle Capital Needs

Table A-1. Avoided Infrastructure Life-Cycle Capital Needs ($K) FY02-FY10 Resulting from Restoration/Optimization LICP.

Infrastructure Project/Activity	Funding Type	Funding Years	FY-02	FY-03	FY-04	FY-05	FY-06	FY-07	FY-08	FY-09	FY-10
Steam and Condensate Systems Upgrade Steam/Condensate Lines at CFA-671	GPP	2002	1,500								
Boiler/Heating Systems Mechanical, CFA-671Heating Source Upgrade	GPP	2002	2,400								
CFA-660 ECC and Electrical Upgrades	GPP	2003		468							
CFA-623 Electrical & HVAC Upgrades	GPP	2003		658							
CFA-624 HVAC Upgrades	GP	2003		400							
CFA-674 Warehouse Replace	GPP	2003		4,978							
Road Safety Equipment/Material Storage Bldg	GPP	2004			381						
CFA-664 Storage Building Upgrade and Roof Replacement	GPP	2004			1,784						
CFA-624 Multi-Craft Shop Addition, HVAC and Structural Upgrades	GPP	2004			3,568						
Emergency Notification System Upgrades (Down-scoped)	GPP	2004			550						
CFA-684 Flammable Storage Bldg. Replace	GPP	2005				595					
CFA-753 Water Tank Mech. Upgrades	GPP	2005				339					
CFA-621 Multi-Craft Shop HVAC Upgrades	GPP	2006					100				
CFA-622 Multi-Craft Shop HVAC Upgrades	GPP	2006					110				
CFA-623 Multi-Craft Shop HVAC Upgrades	GPP	2006					110				
CFA-660 Laborers and Equipment Operator Building New Roof	GPP	2006					75				
Water Distribution System Mechanical Upgrades, Replace two Deep Well Pumps every 10 Years	GPP	2006					50				
CFA-621 Multi-Craft Shop Mechanical Upgrades	GPP	2009								150	
CFA-622 Multi-Craft Shop Mechanical Upgrades	GPP	2009								165	
CFA-601 Warehouse Replace	LICP	2009-14								45	364
CFA-651 Pumphouse Replace	GPP	2010									27
Water Distribution System Mechanical Upgrades	GPP	2010									3,000
Sewage Disposal System Mechanical Upgrades	GPP	2010									4,500
CFA-697 Equipment Storage Replace	GPP	2010									525
Fire Water Systems General Upgrades (Down-scoped)	GPP	2010									375
Infrastructure Project Totals			3,900	6,504	6,283	934	445	-	-	360	8,791

Total Avoided Life Cycle Capital Costs Through FY2010 = $27,217 K

Appendix B

Cost Estimates

Appendix B

Cost Estimates

Below is a TPC estimate (summary table) for the individual subprojects and then a lengthy table showing all the cost category estimates for each subproject. Note: because this is the pre-conceptual CD-0 effort, only the likely cost-effective alternatives were estimated. The other alternatives for each subproject were judged for cost ranking relative to the likely solution. All such other alternatives were judged to be higher in cost relative to the likely cost-effective alternative.)

Summary Table	$K TPC
CFA Substation High-Voltage Bus Upgrade	1,930
CPP-606 Service Building/Powerhouse Electrical, Mechanical, and Roof Upgrades	5,060
INTEC Utility Demineralization Upgrade	1,570
INTEC Emergency Communications Upgrade	14,730
INTEC Potable Water Upgrades	370
INTEC Fire Alarm Safety Upgrade	11,860
INEEL High-Voltage Equipment Replacements	30,380
INEEL Road System Upgrade	8,200
Modify INTEC Facilities to Accommodate Crafts and Warehouse Move from CFA	2,060
IRC Laboratory Upgrades	2,643
Total Project Cost (TPC) for the subprojects is	$ 78,803

Fiscal Year cost spread of INEEL Infrastructure Renovation/Optimization LICP

			Fiscal Year								
Subproject	Cost Category	Subtotals	02	03	04	05	06	07	08	09	10
CFA High	CM	513					513				
Voltage Bus	T I	113			113						
	T II	157			157						
	QA	13					13				
	PM	200			60		140				
	AE Const Sup	28					28				
	GFE	0									
	Construction	551					551				
	TEC Subtotal	1575	0	0	330	0	1,245	0	0	0	0
	Proj Dev	255	37	218							
	Proj Sup	70			20		50				
	Proj Accept	30					30				
	OPC Subtotal	355	37	218	20	0	80	0	0	0	0
	TPC	1930	37	218	350	0	1,325	0	0	0	0

			Fiscal Year								
Subproject	Cost Category	Subtotals	02	03	04	05	06	07	08	09	10
INEEL High	CM	1054					150	454	450		
Volt Equipment	T I	339			339						
	T II	359				359					
	QA	418					50	180	188		
	PM	1034			45	75	204	350	360		
	AE Const Sup	80					15	35	30		
	GFE	12798					4000	4798	4000		
	Construction	12293						6000	6293		
	TEC Subtotal	28,375	0	0	384	434	4,419	11,817	11,321	0	
	Proj Dev	750	500	250							
	Proj Sup	210			30	30	20	65	65		
	Proj Accept	1045						400	645		
	OPC Subtotal	2005	500	250	30	30	20	465	710	0	
	TPC	30380	500	250	414	464	4,439	12,282	12,031	0	0
CPP-606	CM	187				87	100				
Upgrades	T I	215			215						
	T II	296			43	253					
	QA	10				4	6				
	PM	55			10	15	30				
	AE Const Sup	77				40	37				
	GFE	45				45					
	Construction	3325				1000	2325				
	TEC Subtotal	4,210	0	0	268	1444	2498	0	0	0	0
	Proj Dev	420	100	320							
	Proj Sup	215			33	40	142				
	Proj Accept	215					215				
	OPC Subtotal	850	100	320	33	40	357	0	0	0	0
	TPC	5,060	100	320	301	1,484	2,855	0	0	0	0
INTEC Emerg	CM	692							342	350	
Communication	T I	485			485						
	T II	898				450	448				
	QA	37							17	20	
	PM	312			40	40	40	20	80	92	
	AE Const Sup	294							144	150	
	GFE	0									
	Construction	10747							5000	5747	
	TEC Subtotal	13,465	0	0	525	490	488	20	5,583	6,359	0

Subproject	Cost Category	Subtotals	Fiscal Year 02	03	04	05	06	07	08	09	10
	Proj Dev	625	68	557							
	Proj Sup	225			20	20	20		75	90	
	Proj Accept	415								415	
	OPC Subtotal	1,265	68	557	20	20	20	0	75	505	0
	TPC	14,730	68	557	545	510	508	20	5,658	6,864	0
INTEC Fire Alarms	CM	347					200	147			
	T I	573			573						
	T II	765				765					
	QA	27					15	12			
	PM	189			40	50	50	49			
	AE Const Sup	164					100	64			
	GFE	0									
	Construction	8575					5000	3575			
	TEC Subtotal	10,640	0	0	613	815	5,365	3,847	0	0	0
	Proj Dev	510	200	310							
	Proj Sup	220			20	20	110	70			
	Proj Accept	490					100	390			
	OPC Subtotal	1,220	200	310	20	20	210	460	0	0	0
	TPC	11,860	200	310	633	835	5,575	4,307	0	0	0
INTEC Potable Water	CM	48					48				
	T I	15			15						
	T II	29			29						
	QA	4					4				
	PM	27			10	5	12				
	AE Const Sup	3					3				
	GFE	0									
	Construction	119					119				
	TEC Subtotal	245	0	0	54	5	186	0	0	0	0
	Proj Dev	75		75							
	Proj Sup	25			10		15				
	Proj Accept	25					25				
	OPC Subtotal	125	0	75	10	0	40	0	0	0	0
	TPC	370	0	75	64	5	226	0	0	0	0

Subproject	Cost Category	Subtotals	Fiscal Year 02	03	04	05	06	07	08	09	10
INTEC Demin	CM	145				145					
Water	T I	31			31						
	T II	67			67						
	QA	53				53					
	PM	83			30	53					
	AE Const Sup	16				16					
	GFE	0									
	Construction	1020				1020					
	TEC Subtotal	1,415	0	0	128	1,287	0	0	0	0	0
	Proj Dev	75	45	30							
	Proj Sup	50			20	30					
	Proj Accept	30				30					
	OPC Subtotal	155	45	30	20	60	0	0	0	0	0
	TPC	1,570	45	30	148	1,347	0	0	0	0	0
INEEL Roads	CM	654								654	
	T I	66			66						
	T II	68			68						
	QA	118								118	
	PM	459			40					419	
	AE Const Sup	57								57	
	GFE	0									
	Construction	6543								6543	
	TEC Subtotal	7,965	0	0	174	0	0	0	0	7,791	
	Proj Dev	150	50	100							
	Proj Sup	60			20					40	
	Proj Accept	25								25	
	OPC Subtotal	235	50	100	20	0	0	0	0	65	
	TPC	8,200	50	100	194	0	0	0	0	7,856	
Relocate CFA	CM	322				322					
Crafts/Whouse	T I	86			86						
	T II	113			113						
	QA	30				30					
	PM	161			40	121					
	AE Const Sup	8				8					
	GFE	0									
	Construction	1060				1060					

Subproject	Cost Category	Subtotals	02	03	04	05	06	07	08	09	10
			Fiscal Year								
	TEC Subtotal	1,780	0	0	239	1,541	0	0	0	0	0
	Proj Dev	150	90	60							
	Proj Sup	50			20	30					
	Proj Accept	80				80					
	OPC Subtotal	280	90	60	20	110	0	0	0	0	0
	TPC	2,060	90	60	259	1,651	0	0	0	0	0
IRC Laboratory	CM	92				92					
Upgrades	T I	110			110						
	T II	152			152						
	QA	9				9					
	PM	48			20	28					
	AE Const Sup	36				36					
	GFE	0									
	Construction	1773				1773					
	TEC Subtotal	2,220	0	0	282	1,938	0	0	0	0	0
	Proj Dev	240	160	80							
	Proj Sup	63			25	38					
	Proj Accept	120				120					
	OPC Subtotal	423	160	80	25	158	0	0	0	0	0
	TPC	2,643	160	80	307	2,096	0	0	0	0	0
Total Project	TEC	71,890	0	0	2,997	7,954	14,201	15,684	16,904	14,150	0
FY Totals	OPC	6,913	1,250	2,000	218	438	727	925	785	570	0
	TPC	78803	1250	2000	3215	8392	14,928	16,609	17,689	14,720	0

Appendix C

Location/Source of Development Files

Appendix C

Location/Source of Development Files

In addition to the references cited in Section 12 of the text, Mr. Steve Davies, Engineering Fellow and Project Engineer on the development of this Line-Item Construction Project (LICP) has consolidated all applicable files for all the subprojects from the many respective engineers and cost estimators. These are outlined below:

- Infrastructure Restoration Project back-up CD (contains all electronic files), Steve Davies
- INEEL/INT-2000-01228, September 2000, INTEC Utilities Condition Assessment Non-Process Water System, Kevin C. Barton
- INEEL/INT-2000-01226, September 2000, Utilities Condition Assessment Compressed Air Systems, Kevin C. Barton
- Drawings (highlighted):

5259-IF-603-H-204	HVAC Air System
5259-IF-603-H-210	Penthouse Equip. Plan
5259-IF-603-H-205	1st Floor Plan – North
5259-IF-603-H-206	1st Floor Plan – South
5259-IF-603-H-201	Equipment Schedule
5243-IF-602-M-207	Penthouse HVAC Plan
5243-IF-602-M-208	Penthouse HVAC Details
5243-IF-602-M-200	Equipment Schedule

- Melissa Flyckt (Civil Engineer) file: entitled “Infrastructure” (blue folder) study details of CPP-606 service building powerhouse, INEEL railroad, INEEL building roofs, and INEEL roadways
- Steve Davies (Project Engineer) file: 0105 – Project Management Infrastructure Restoration (light green folder) miscellaneous file materials on all aspects of the restoration LICP proposal
- Ken Barnes (Electrical Engineer) file (gray hanging file folder): development details of CFA substation work, high voltage component replacements, INTEC emergency communications and fire alarm upgrade needs
- INEEL Infrastructure Restoration (manila pocket folder): compilation of all reports for each of the subprojects
- Infrastructure Restoration Project Estimates (DRAFT), file number 8561 by John Lundblade in Estimating department.

Appendix D

Alternative Analyses

Appendix D

Alternative Analyses

CFA HIGH VOLTAGE BUS UPGRADE

Problem Statement

Performing required maintenance on the high voltage bus and high voltage insulators at the Central Facilities Area (CFA) is cost prohibitive. The required maintenance involves performing testing (visual, infrared, audible, hi-pot, and mechanical torque) on the high voltage bus and insulators at CFA. In order to perform the required maintenance, a total site-wide outage will be required. The magnitude of the outage and required work exceeds Power Management capability.

Background

The high voltage bus and insulators at CFA provide an insulating material between the high voltage overhead line and the supporting structure. The voltage level on the line is 138 kV. The overhead line is also referred to as the high voltage bus.

The age of the high voltage bus and insulators is more than 50 years old. Their normal design life expectancy is 30 years. The design life is based on National Fire Protection Association (NFPA) 70B, "Recommended Practice for Electrical Equipment Maintenance," and Institute of Electrical and Electronic Engineers (IEEE) Standard 493, "Reliable Industrial and Commercial Power Systems." By virtue of their age, the probability of failures of the insulators, strain bus, or mechanical connections to the high voltage points is significantly increasing.

The age and condition of the high voltage insulators can be verified by the noise (corona) emanating from them. The more corona, the older and more deteriorated the insulators are. Currently, the corona is very noticeable when inspecting the insulators. The age of the high voltage bussing can be verified by observing the corrosion on the overhead lines. Currently, there is significant corrosion on the high voltage bussing.

If a bus insulator or strain bus failure occurs, the bussing may drop down or swing causing high voltage electrical safety hazards and a potential for a phase-to-phase or phase-to-ground short. A failure of a bus insulator or strain bus would result in a total site-wide unplanned outage due to the proximity of the east and west bus in the substation yard. Recovery from this type of failure would require replacement of the failed insulators or strain bus components.

Sharp edges exist at each mechanical connection at the insulator or strain bus. These edges produce a corona (which can be heard as noise). The corona results in a loss of real power. New designs and materials minimize or eliminate this corona. The amount of power loss is difficult to measure due to its dependency on load, but approximately 0.1% of the power transferred is lost due to corona.

Specific Drivers

The main driver for this project is the ability for Power Management to provide safe, reliable power continuously to the Idaho National Engineering and Environmental Laboratory (INEEL).

There is no one document containing requirements for replacement of the insulators or strain bus. There are, however, documents that recommend maintenance practices and determine approximate useful design life. In addition, the INEEL is required to practice energy efficiency, energy management, and energy conservation. These are implemented in various Department of Energy (DOE) orders, DOE A/E standard, management control procedure (MCP)-2811, Secretary of Energy Memorandums and Presidential Memorandums. Replacement of the high voltage bus insulators and strain bus allows the INEEL to operate in compliance with the aforementioned requirements.

DOE service life of equipment states that the expected life transmission and distribution equipment is 30 years. The age of the insulators is approximate 20 years beyond this expected design life.

Alternatives/Evaluations

There are three options that are considered for this evaluation. With each option, there are identified consequences that may result from the option. The options are generated using best engineering judgment based on past historical events. Another option to be pursued during conceptual design would be to sell the INEEL electrical power distribution system to a power company.

<u>Alternative #1</u> Do not replace the high voltage bus insulators or strain bus and its mechanical connections. The consequences of this could be catastrophic. If an insulator or strain bus connection fails, this could result in an arc or short, which could result in loss of power for the east and west bus. This would result in a total site-wide unplanned outage. The time it would take getting power back to the site would be a function of how significant the failure is. In addition, use of the existing insulators results in real power energy loss from the high voltage system.

<u>Alternative #2</u> Perform required maintenance and testing. The required maintenance consists of performing a visual inspection of each insulator. Then testing each insulator using infrared sensors, audible-sensing devices, equipment for hi-potting and checking mechanical torque for the connections. This maintenance work order will be generated using proper and approved maintenance work orders generated through company’s work control system. The effort of generating such a work order for specific insulators and strain bus and the resulting work effort will be approximately equal to the work for replacement of the same insulators. The main difference being cost of the insulators and wire. It does not appear to be cost effective to perform required maintenance on the CFA high voltage bus insulators and strain bus in lieu of replacing the insulators and bussing at this time. This alternative should be revisited during conceptual design to ensure that the costs with total replacement are a near equal tradeoff.

<u>Alternative #3</u> Replace the existing high voltage bus and insulators with modern design equivalents. Modern designs include better materials such as polymers made up of silicon alloy rubber. Modern designs reduce current leakage, reduce corrosion, and cut corona to minimal levels. Replacement will improve efficiency, increase reliability, and improve safety of the high voltage electrical distribution system.

In order for the CFA high voltage bus insulators to be utilized to their scheduled date based on the Infrastructure Long-Range Plan, replacing the high voltage bus insulators and strain bus has to be performed to meet their functional life expectancy.

Conclusion

Alternative #3 is the likely best choice at this time. Alternative #3 work scope is as follows:

The general work scope for replacement of the CFA high voltage bus insulators would consist of the following:

- Design Phase (Conceptual, Title I, Title II)
- Construction Phase and Title III Support
- Outage preparation
- Installation and testing
- Turnover and closeout.

The design phase would select the appropriate high voltage bus insulator for the application and location. An example of an insulator would be Veri*Lite made by Ohio Brass. The design phase shall include what outage is required to replace some of the insulators where they are in proximity to other energized buses. In addition, the strain bus and required mechanical connections will be replaced with a modern design consisting of a combination of rigid and strain bus. The construction phase would consist of procurement and installation of the new insulator and strain bus. The subcontractor would be required to work closely with the operating contractor due to the complexity of the outage required. Manufacturers recommended testing and other applicable INEEL Power Management testing requirements would be performed before the high-voltage bus is released for operation.

CPP-606 Services Bldg/Power House Mechanical/Electrical/Structural Upgrades

Problem

In order for the Chemical Processing Plan (CPP)-606 service building/powerhouse to continue providing utilities for the Idaho Nuclear Technology and Engineering Center (INTEC), the following problems will need to be resolved:

1. The lighting and electrical circuits in CPP-606 do not meet Illuminated Engineering Society (IES), National Electric Code (NEC), and Department of Energy Idaho Operations Office (DOE-ID) A/E Standard requirements. The lighting level does not meet the IES-recommended lighting levels. In addition, some of the branch circuit wiring at CPP-606 is old and the insulation crumbles whenever it is handled.

2. The current water softening system has to be manually operated due to an ineffective control system.

3. Numerous water leaks exist in the deteriorating piping associated with the water softener system.

4. The existing raw water pumps are oversized for the actual flow rates required and cannot be efficiently throttled to operate at the varying demands of the raw water system.

5. The support structure for the sulfuric acid tank does not meet seismic loading requirements.

6. The air receiver pressure vessels are ~50 years old and are showing signs of excessive corrosion/pitting. Also, these vessels have had welding performed on them violating the code stamp of the vessels.

7. The plumbing of the compressed air system does not allow for the isolation of filters and prefilters for the performance of routine maintenance without a complete outage of this service.

8. The INTEC CPP-606 Service Building/Powerhouse roof (transite with oversprayed asbestos) has deteriorated to a point that maintenance to the roof has become costly and unsafe.

Background

The CPP-606 service building (powerhouse) was constructed in 1951 and currently houses various utility systems. This facility contains four oil-fired steam boilers as well as the compressed air systems, plant breathing air systems, plant raw water systems, plant treated water systems, plant fire water pumps, and the air handling systems for CPP-601 and -602. The projected end use date for the CPP-606 building is the year 2040. The Service/Powerhouse facility is required to remain operational to supply services to the mission-related buildings at INTEC. The CPP-606 structure is constructed of riveted steel framing with corrugated asbestos siding and roofing. The walls and roof are insulated with 2 in. of rock wool, which is a lightweight mineral fiber insulation.

1. There have been many electrical upgrades in CPP-606 since it was constructed. All of the problems have not been corrected. The main problem is the lighting and wiring downstream from 120-VAC panel boards. The lighting does not meet IES standards for adequate illumination for an industrial work area. IES states for an industrial work area, 20- to 50-ft candles are required. Currently, most areas in CPP-606 have lighting well below the 20-ft candle minimum. When operating the boiler

control panels or performing any work, temporary lighting must be utilized to provide adequate illumination. Replacing the lighting cannot be performed due to the age of the wiring feeding the lighting. The wiring has aged to the point where any handling of it causes the insulation to crumble. In addition, multiwire branch circuits (or Edison circuits) exist in the building feeding the lighting and outlets. Per the current revision of the DOE-ID A/E standard, Edison circuits are not allowed. There exists numerous NEC code violations including, improper wiring sizing as well as exceeding conduit fill. There are also a few of the remaining 120/208-VAC panel boards that did not get replaced by other projects. These old panel boards can no longer provide the required level of safety, protection, and reliability for the expected life of the facility. In addition, spare parts for these old panels are no longer available.

2. The existing water softener controls are in a state of disrepair and are based on outdated control technology. The resin columns are manually regenerated based on routine monitoring of the water quality. This results in water quality levels that fluctuate and often the columns are regenerated too frequently. Every time that the columns are regenerated, a large amount of sodium is discharged to the service waste system. The high levels of sodium in the service waste result in violations of the Environmental Protection Agency's discharge limits. A new control system would allow for the automatic control of the water softener system and fewer regeneration cycles.

3. Many of the pipe flanges associated with the water softening system are leaking water. The numerous water leaks have caused excessive corrosion to occur to piping and control system components.

4. The raw water system in CPP-606 includes three pumps that pressurize the raw water distribution system as well as provide water to the treated water system. Only one of these pumps is required to operate at a time. The pumps consist of two 250-horsepower pumps and one 200-horsepower pump. There is currently no instrumentation available to monitor the actual water flows required by the plant's demands. Upon further investigation, it was found that these pumps are operating near their 'dead head' pressure ratings. Utility operations have had to replace the pumps and impellers several times in the past few years as a result of cavitation damage. Since the current system has no way to modulate the pumps based on the demand, a considerable amount of energy is wasted. Evaluating the actual raw water demands at INTEC needs to be performed and then new pumps can be sized and installed. The new pumps will require the use of variable frequency drives to account for the fluctuating flow rates that are required.

5. In 1995, a seismic analysis/evaluation was performed on the sulfuric acid vessel, VES-UTI-709. This analysis indicated that the supporting structure for this vessel is seismically inadequate. The sulfuric acid system is classified as a performance category one (PC-1) system. Vessel 709 is an 8,000-gallon tank that was installed in 1985.

6. The plant air system in CPP-606 includes four air receivers, VES-UTI-616, -617, -618, and -619. Each vessel is 4 ft in diameter and 12 ft high. These vessels have been in service for 50 years. Recent unfired pressure vessel inspections indicate that corrosion/pitting is close to the allowable limits. Also, these vessels have been modified without the proper code-stamped weldments.

7. The plant air system also includes two sets of filters that need to be upgraded to include proper isolation valves to support maintenance of the filters. Currently, the filters cannot be isolated without a complete system outage; as a result, these filters are seldom serviced. The existing valves do not close completely and there are no provisions for double isolation. Filters designated F-UTI-501, 502, and 503 are installed in 4-in. lines and filters designated F-UTI-604 and 605 are

installed in 6-in. lines. The current piping system does not provide for the connection of a temporary air source upstream of the filters in case the air compressors are taken out of service. Installation of a temporary connection would provide the necessary emergency back-up capability for this system.

8. The CPP-606 Service/Powerhouse facility is a 13,510-sq. ft building that was built in 1953. The building was constructed of steel framing with corrugated transite siding and roofing. At one point, the siding and roofing was overlaid with a layer of sprayed-on asbestos.

    Over the years, the transite roofing has deteriorated such that it does not possess any structural strength that would allow workers on top of it. Workers must be suspended in a basket hoist, not allowing any weight to be transferred to the roof.

    The sprayed-on asbestos layer has begun to break apart releasing fibers into the air. The interfaces between the roof and the penetrating pipes have deteriorated allowing water entry. The rainwater seeps through the cracks, carrying the released asbestos fibers, draining into the interior of the building.

Specific Drivers

- DOE-ID A/E Standard
- NFPA 70, NEC
- Illuminating Engineering Society (IES) of American Executive Order 12941,
- Seismic Safety of Existing Federally Owned or Leased Buildings
- DOE Order 420.1, “Facility Safety”
- CFR, Title 10, “Energy,” Part 73—“Physical Protection of Plants and Materials”
- DOE Order 430.1—“Life-Cycle Asset Management”
- DOE Order 5480.19—“Conduct of Operations Requirements for DOE Facilities”

Alternatives/Evaluations

Each alternative below identifies the pros and cons that may result. The alternatives are generated using best engineering judgment generated from identified drivers and based on past historical events.

Lighting and Electrical Circuits

Two alternatives are considered for this evaluation.

<u>Alternative #1</u> Do not replace any lighting or circuits in CPP-606.

Performing work in any area of the building without adequate lighting will continue to be a safety hazard. Use of circuits where the wire insulation is crumbling is not only a safety hazard but also a fire hazard. The old panel boards may not provide the required level of safety, protection, and reliability in the event of an over-current or short circuit condition.

Alternative #2 Replace the required wiring, panel boards, and lighting in CPP-606.

This would eliminate the safety and fire hazard of the wiring. It will bring the electrical wiring into compliance with the NEC and DOE-ID A/E Standard and provide adequate lighting as recommended by IES.

Water Softener Controls

Alternative #1 Do nothing.

The lack of control of this system would continue and require manual operation by the utility operators. The water quality will continue to fluctuate and excessive amounts of sodium would continue to be sent to the service waste system.

Alternative #2 Repair the existing control system.

The existing control system does not effectively track the volume of water treated and still requires an operator to initiate the regeneration cycles. The efficiencies that can be gained by the use of existing water softener control system technology will not be realized and high levels of sodium will continue to be sent to the service waste system.

Alternative #3 Upgrade the control system to current day technology.

Installation of a new control system on the water softener will allow for the automatic control and monitoring of this system. The water quality will be maintained at a constant level and the discharge of sodium to the service waste system will be minimized.

Water Softener Piping Upgrade

Alternative #1 Do nothing.

The piping will continue to leak and cause corrosion of the piping, valves, and control systems. Eventually the piping will fail in a manner that causes unscheduled outages of this utility.

Alternative #2 Replace the piping.

Water leaks will be eliminated and allowances will be provided for new instrumentation and controls.

Raw Water Pumps

Alternative #1 Do nothing.

The existing 200–250 horsepower pumps will continue to be manually operated 24 hours per day, 365 days a year, regardless of the actual water demands of the system. The pumps will continue to be damaged as a result of excessive cavitation and require routine repair/replacement.

Alternative #2 Upgrade Raw Water Pumping System.

Provide instrumentation to determine the actual raw water usage at INTEC. Properly size new raw water pumps. Provide new pumps that utilize variable frequency drives so that the operation of the pumps can be matched to actual raw water demands. The alternative would eliminate the routine repair/replacement of these pumps and also save a considerable amount of electrical utility costs.

Acid Tank Seismic Upgrade

Alternative #1 Do nothing.

The structural supports for the acid tank will remain in a deficient condition relative to seismic requirements. The worst case condition is that during a seismic event, the structural supports for this tank could fail and release several thousand gallons of concentrated sulfuric acid.

Alternative #2 Modify the structural supports.

The structural supports for this vessel will be upgraded per industrial safety codes and standards. The primary objective of the DOE order is to ensure that all DOE facilities are designed and constructed so that the general public, worker, and the environment are protected from any impact of natural phenomena hazards.

Upgrade of Plant Air Receivers

Alternative #1 Do nothing.

The 50-year-old vessels will continue to deteriorate and the pressure vessel inspection program will require that these vessels be taken out of service in the near future.

Alternative #2 Upgrade the air receivers.

The existing air receivers should be taken out of service and the plant air system upgraded to include new air receivers. This work will most likely need to be coordinated with the roof replacement, since the air receivers will be difficult to remove and replace due to the congestion inside of the facility.

Upgrade Plant Air Piping

Alternative #1 Do nothing.

The air filters associated with the plant air system will continue to operate without the needed maintenance. This will result in the eventual plugging/failure of the filters requiring an unscheduled outage for this system.

Alternative #2 Upgrade the plant air piping to include double isolation valves for the filters and install emergency connection ports upstream of the filters.

Isolation valves for the filters will include 4-in. valves for filters F-UTI-501, -502, and -503 and 6-in. valves for filters F-UTI-604 and -605. Emergency connections will be installed upstream of the two sets of filters. The connections will be 4-in. diameter piping that includes double isolation valves and blind flanges. The lines where the emergency connection will be installed are 6-in. lines labeled 6-in.-HA-NN-109655 and -101605.

Roof Upgrade

Alternative #1 Do nothing.

The roof will continue to degenerate and leak until it will become unsafe to operate or perform work inside the CPP-606 facility. Workers will still be prohibited from the roof surface. Work on the roof or penetrating pipe systems will continue to be performed while suspended from hoist baskets.

<u>Alternative #2</u> Weatherize the existing roof.

Apply another seal coat layer to the existing roof to stop the seepage of water and the breaking up of the current asbestos layer. The seal coat will need to be reapplied at an interval determined by the product's manufacturer. This seal coat layer will not structurally stabilize the existing roof. Workers will still be prohibited from the roof surface. Work on the roof or penetrating pipe systems will continue to be performed while suspended from hoist baskets.

<u>Alternative #3</u> Remove old roof and install a new roof system.

Safely remove the corrugated transite roofing and sprayed-on asbestos layer. Reinforce the existing truss/purlin roof system, as required, to accept the load from a possible heavier roof structure. Replace the roof surface with a structurally and environmentally sound system. The new roof will prevent the spread of asbestos fibers to workers inside and outside of the structure. The roofing will be structurally stable to allow workers to walk on its surface to perform work as required.

Conclusion

The most likely cost-effective alternatives for each phase of this project are listed below:

1. Lighting and Electrical Circuits

   The most likely cost-effective solution for correction of the electrical deficiencies in CPP-606 is Alternative #2—replacement of the required wiring, panel boards, and lighting.

   A field survey will be required to identify which panel boards need to be replaced. A field survey will also be required to determine the feasibility and location of routing new raceways throughout the facility to replace the old wiring. New lighting designs can be vendor provided. Vendor software can identify where and how much lighting to install as recommended by IES.

   Construction would install the lighting as recommended by the manufacturer and as required by contract drawings/documents. Construction would replace panel boards and wiring as specified.

2. Water Softener Controls

   The most likely cost-effective solution is Alternative #3—upgrade the control system to current day technology.

3. Water Softener Piping Upgrade

   The most likely cost-effective solution is Alternative #2—replace the piping.

4. Raw Water Pumps

   The most likely cost-effective solution is Alternative #2—upgrade Raw Water Pumping System.

5. Acid Tank Seismic Upgrade

   The most likely cost-effective solution is Alternative #2—modify the structural supports.

6. Upgrade of Plant Air Receivers

   The most likely cost-effective solution is Alternative #2—upgrade the air receivers.

7. Upgrade Plant Air Piping

   The most likely cost-effective solution is Alternative #2—upgrade the plant air piping to include double isolation valves for the filters and install emergency connection ports upstream of the filters.

8. Roof Upgrade

   The most likely cost-effective solution is Alternative #3—remove old roof and install a new roof system.

INTEC UTILITY DEMINERALIZATION UPGRADE

Problem

The existing polyvinyl chloride (PVC) demineralized water distribution line in the INTEC utility tunnel continually fails and leaks.

Background

The existing demineralized water distribution line is 3-in. PVC piping and was installed approximately 20 years ago. The system delivers 2,000 gallons per day to five facilities. Frequently, the line develops cracks and pinhole leaks over time due to water hammer, thermal expansion/contraction, and the improper spacing of supports for the type of material. The pipe is bowed in several places and has lost its rigidity. The pipe continually fails and will severely impact INTEC FAST operations when the pipe catastrophically fails. This, in turn, creates a potential for injury and is a safety risk to personnel in nearby areas.

Specific Drivers

- American Society of Mechanical Engineers; ASME B31.9, “Building Services Piping”
- American Standard of Testing and Materials; ASTM
- CFR 29 Part 1910, Occupational Safety and Health Standards; Slipping and Tripping Hazards.
- DOE-ID Architectural Engineering Standards

DOE Order 123.1a, Section 4.b states known unsafe conditions shall be corrected and no exceptions are given.

Alternatives/Evaluations

The alternatives to the problem are to leave the PVC pipe as is, or replace it with a suitable material. Currently, there are many leaks on this pipeline. It takes time and money to fix these deficiencies, especially since the tunnel is defined as a confined space. As time goes on, the failures will most likely get increasingly greater. Since the piping material has already exceeded its elastic yield, there is a high possibility of complete failure. This, in turn, affects operations at FAST, creating a potential for a safety hazard.

Conclusion

The demineralized water distribution pipe has failed in numerous places. The possibility of a catastrophic failure exists. It is recommended that the 3-in. PVC line be replaced with stainless steel to drastically reduce maintenance activities and potential safety hazards. The new system shall supply all current facilities served by the existing line. A re-circulation loop shall circulate the water minimizing stagnant water and therefore maintaining the purity level in the system. Expansion joints shall be incorporated into the pipe system to minimize thermal expansion/contraction effects. Throttling valves shall be used to minimize water hammer effects. Existing supports shall be used as appropriate. Some supports may need modification. New supports for the re-circulation line shall be considered part of the scope of this work.

INTEC EMERGENCY COMMUNICATIONS UPGRADE

Problem

The emergency notification system for INTEC is old, difficult to maintain, and unreliable. The system is not supervised and does not provide the sound levels required by current standards. Two failures last year lasted over 24 hours each time. Maintenance last year cost $79.5K. Noncompliance and lack of direct occupant notification for most INTEC buildings puts property and lives at risk.

Background

INTEC is currently supported by two emergency notification systems: voice paging system (VPS) and the Emergency Communication System (ECS). These systems together provide fire alarm and nuclear critically notification throughout INTEC. The VPS serves approximately 53 INTEC buildings as the sole notification. The ECS serves approximately 49 buildings at INTEC (some of which are the same as the VPS). The ECS has been modified to the extent that current use exceeds the original design capacity of the equipment and wiring. These modifications created an unreliable system. In addition, replacement parts for the older part of the system are no longer manufactured. Previous modifications performed were not completed due to funding issues. This creates a consistency and interaction issue, which results in an unreliable system prone to failure. Subsequent maintenance becomes difficult to perform due to availability of spare parts, having trained technicians available, and the complexity of performing work on a system that is already operating beyond capacity and interaction with other systems.

The VPS is failing due to lack of maintenance and age of the system. Speakers utilized by the VPS do not provide the required sound levels (measured in dB) to personnel in the affected areas. Current requirements state sound levels should be greater than 75 dBA and 15 dBA above ambient. Currently, the VPS is not supervised as required by current standards. Supervision consists of a health check of available power during operation. The VPS does not support visual devices (strobes) as required by current Occupational Safety and Health Administration (OSHA) and NFPA standards. The VPS does not provide audible coverage of areas and buildings as required by current standards. Buildings presently covered by the VPS and those that are not covered will need an installation of conduit, wire, speakers, and strobes to meet the OSHA/NFPA-required coverage.

If the ECS/VPS fails, then INTEC operations are directly affected. Operations affected include, but are not limited to, cessation of all fuel movement and restricted constructive, maintenance, and operation activities. When the ECS/VPS fails, building occupants will not be notified of a fire in their building and the all-area evacuation/alert signals for nuclear criticality alarm will not operate. The ECS is used for INTEC building fire alarm evacuation and notification. No other automatic means are available to inform personnel of a fire in their facility. In the unlikely event of a fire in an INTEC building, affected occupants may not hear the fire evacuation alarm.

Specific Drivers

- NFPA 72, 1999 edition, National Fire Alarm Codes Chapter 1, Section 5.8, “Supervision”
- NFPA 72, 1999 edition, National Fire Alarm Codes Chapter 6, Section 3, “Sound Levels”
- Uniform Fire Code, 1997 edition
- 29 CFR 1910.165 d.4, Requires Supervision
- 29 CFR 1910.165 b.2, Fire Alarm Minimum Sound Levels and Visual Devices
- 29 CFR 1096 f 1 ii, Evacuation Sound Level

Alternatives/Evaluations

An evaluation is currently underway, which will determine the feasibility of simplifying the entire INEEL fire alarm system and making all INEEL fire alarm panels consistent with each other. The ECS interface with the INEEL fire alarm system will be evaluated and the specific alternative for improvement of the ECS and VPS will be selected pending further analysis.

<u>Alternative #1</u> Do not replace any portion of the ECS or VPS.

The consequences of not replacing the ECS or VPS will be continued high maintenance costs, continued down time of the system, unreliability, and code violations.

<u>Alternative #2</u> Replace the entire ECS and VPS with systems that comply with the industry standard and are compatible with any recommended modifications resulting from the ongoing evaluation of replacement of the fire alarm system. In addition, strobes and speakers are to be installed to meet current requirements.

Conclusion

Alternative #1 is not acceptable from a life safety perspective.

The general work scope for the likely best solution, replacement of the ECS and VPS, would consist of the following:

- Study availability of equipment meeting the specific need of INTEC
- Study reuse of existing verses installing new wiring in the new system
- Design Phase (Conceptual, Title I, Title II)
- Construction Phase and Title III Support
- Fire Alarm Panel Outage preparation
- Installation and testing
- Turnover and close out.

During ECS and VPS outages, occupant notification, a fire watch, and restriction of activities would be necessary. Based on the specific type and model of ECS and VPS selected, the use of existing wiring and fiber optics verses installing new wiring would be evaluated.

INTEC POTABLE WATER UPGRADE

Problem

In order for the CPP-663 maintenance building to provide for a safe delivery of potable water, the following problems will need to be resolved:

- The potable water lines do not meet the intent of current drinking water/cross-connection control standards
- The potable and non-potable water lines are mislabeled throughout the facility
- Treated (demineralized) water is cross-tied into the potable water system and is only separated by one isolation valve
- The safety shower/eyewash is not provided with tempered water as required by American National Standards Institute (ANSI) Z358.1-1998, “Emergency Eyewash and Shower Equipment.”

Background

The CPP-663 maintenance building was constructed in 1980 and houses maintenance support, craft, and warehousing operations. The building currently has a single water distribution system that distributes potable water to restrooms, drinking fountains, showers, safety showers/eyewashes, and all craft shop areas without any separation based on the type of usage.

The 4-in. potable water supply piping feeding the building branches out throughout the facility without proper protection (i.e., approved backflow prevention device). Water lines throughout the facility are labeled as treated, raw, potable, industrial, hot, and cold and are all fed from the same potable water supply that enters the building.

Specific Drivers

- OSHA Standard 1910.141 and 1926.51
- Uniform Plumbing Code, UPC-1997
- IDAPA 16.01.08, “Idaho Rules for Public Drinking Water Systems”
- IDAPA 07.02, “Rules Governing Plumbing Safety Inspections” (i.e., Pacific Northwest Section of American Water Works Association, Manual of Cross-Connection Control, Rev. 5)
- DOE-ID Architectural Engineering Standards, Water Distribution Systems, Section 0266
- ASME B31.9, “Building Service Piping”
- 29 CFR 1910.141 (b) (1) and (2), “Sanitation”
- American National Standards Institute, ANSI Z358.1-1998, “Emergency Eyewash and Shower Equipment”
- NFPA 70, National Electric Code

Alternatives/Evaluations

There are options that are considered for this evaluation. With each option, there are identified consequences that may result from the option. The alternatives are generated using best engineering judgment generated from identified drivers and based on past historical events.

Alternative #1 Do not upgrade the potable water system in CPP-663.

If the potable water distribution system is not upgraded to comply with standards, it is clear that the potential for contamination of the potable water system in this facility is rather high.

Alternative #2 Install approved backflow prevention devices throughout the facility and re-label all piping.

Installing point-of-use backflow prevention devices may serve as protection for the facility but will increase maintenance costs due to periodic certification and testing of the devices. Furthermore, these devices also degrade the overall performance of the domestic water distribution system. At every point of service installation, there is an associated pressure drop from the internal mechanism of the backflow prevention device.

Alternative #3 Install two new reduced-pressure principal backflow prevention assemblies (RPBA) on the incoming 4-in. potable water supply line to the building and designate everything downstream of this device as industrial water. Install a 2-in. tee on the upstream side of the devices and supply all the potable water needs to the facility from this line. Re-label the potable and industrial water lines as necessary.

This is a viable option and should be considered if appropriate space is available in the facility to install two RPBA devices and associated valves. The two devices would be installed in an accessible location and in parallel to accommodate testing and maintenance on one device while the other is in operation.

Alternative #4 Connect the existing system to the industrial water source located in the adjacent utility tunnel and plumb a 2-in. line from the existing potable water source to the showers, restroom sinks, safety showers/eyewashes, and drinking fountains. Re-label the potable and industrial water lines as necessary.

This is also a viable option and would place CPP-663 in compliance with respect to current regulatory drivers.

Conclusion

Alternatives 3 and 4 are both viable options but since the facility has access to both potable and industrial water sources, Option 4 is the likely cost-effective solution. This would eliminate any certification and testing of backflow prevention devices and reduce the risk of future tie-ins that do not meet current standards.

Along with any option, the treated water (demineralized) must be separated from the potable water. This is not only a cross contamination issue, but the potable water piping (carbon steel) is severely degraded by the presence of demineralized water.

Also, per ANSI 358.1-1998, all safety showers and eyewashes shall be installed with thermostatic mixing valves rated for use with safety showers.

With any option, all of the current pipe labeling should be removed and new labeling placed on the piping after the system has been fully upgraded to meet the required standards.

INTEC FIRE ALARM SAFETY UPGRADE

Problem

The fire alarm system for INTEC is old, expensive ($228K per year), difficult to maintain, and unreliable. The current fire alarm system operation does not directly provide a local annunciation of a fire alarm condition. Some fire alarm panels are not in a location required by DOE-STD-1066-99.

Background

The fire alarm reporting system at INTEC consists of 16 MIPs, 31 MPs, and 2 fire alarm control panels with an auto dialer. Data are sent by the PSS to an Emergency Communication System Panel via the Edwards head and equipment.

The existing fire alarm panels (approximately 89) were installed in 1985 and from 1988–1996. A majority of these panels are obsolete because the manufacturer no longer produces replacement parts or new panels. Currently, when there is a need to obtain a replacement part, the part is either scavenged from removed panels or other INEEL areas where similar equipment is installed. LSS personnel have an increasingly difficult task of locating spare parts. INTEC technicians that perform any maintenance or repair on the fire alarm system have to keep their factory training current with the vendor-provided equipment. When a vendor no longer manufactures a fire alarm panel, factory training is not available. INTEC has fire alarm panels from several different manufacturers that have been purchased by other suppliers and the product lines are no longer available. Keeping an inventory of spare parts for multiple defunct vendors has become impossible.

The level of complexity due to the installation of equipment supplied from several manufacturers and the fact that the fire alarm control panels are required to communicate with the installed alarm receiving equipment at the fire alarm center at CFA is very high. The design, installation, and transmission of the fire alarm signals to the fire alarm center is not required to be a complex operation. Replacement of the fire alarm equipment and simplification of the method used to transmit the signals will reduce the dependence on a single manufacturer and significantly reduce the quantity of inspection, testing, and maintenance that is required to maintain the system at a high operational level.

The ECS now provides the fire evacuation signals for all of the buildings. The fire alarm standard requires that the fire alarm evacuation signal be connected directly to the fire alarm control panel and be supervised by the fire alarm panel. The present fire alarm system interaction with the Emergency Communication System introduces an increased risk of failure. Activation of a fire alarm signal (fire alarm signal can be obtained from either a manual fire alarm station, smoke detector, heat detector, or a waterflow switch) sends the signal to the fire alarm center at CFA using a multiplex telephone circuit. The fire alarm signal is then transmitted back to INTEC over the ECS. The ECS broadcasts an INTEC-wide message informing personnel about the fire alarm. This configuration introduces many failure modes that can and do prevent the building occupants from being notified of an emergency because of equipment failures.

DOE-STD-1066-99 and the Uniform Fire Code require that fire alarm panels be located in an area at or near the main entrance or in an easily accessible area. Some panels at INTEC are not in this required location. The purpose of having a fire alarm panel in the required accessible location is when the fire department responds to an alarm, they check the fire alarm panel to obtain the fire alarm information and plan their response accordingly.

Synopsis

A reliable fire alarm system for occupant and fire department notification of a fire emergency is a DOE requirement for the facilities at INTEC. The existing fire alarm system is prone to both partial and complete system failures. Twice this year system communication has been severed preventing occupant and fire department notification. Compensatory measures for these failures were approximately $10,000+ per incident. Many other partial system failures occur on a weekly basis and cost approximately $5K each time. The system does not comply with NFPA 72, *the National Fire Alarm Code*, requirements for localized occupant notification, standardized fire alarm signaling, distinctive signaling of supervisory alarms, or third party listing and approval. Repairs to maintain the system operational require one full-time employee with an annual cost for labor and material of $228,000.00. Replacement parts for much of the fire alarm equipment are no longer manufactured or available. Currently, the existing fire alarm system is unreliable, does not meet applicable code requirements, is not UL listed, and is difficult to maintain. This unreliable system puts building occupants and facility operations at risk from the effect of a fire.

Specific Drivers

- NFPA 72-1999 edition, National Fire Alarm Code
- Uniform Fire Code-1997 edition
- NFPA 101, “Life Safety Code”
- DOE Order 420.1 and 440.1, “Implementation Guide for Fire Safety Program”
- DOE STD-1066-99, “Fire Protection Design Criteria”

Alternatives/Evaluations

Alternatives that were evaluated needed to consider a current project that is evaluating the entire INEEL fire alarm system. The evaluation is determining the feasibility of simplifying the fire alarm system and making all INEEL fire alarm panels consistent with each other.

<u>Alternative #1</u> Do not replace any fire alarm panels.

The consequences of not replacing the fire alarm panels will be the same as described above—continued high maintenance costs and unreliability.

<u>Alternative #2</u> Simplifying the fire alarm system and installing consistent fire alarm panels will reduce maintenance costs and improve reliability. Replacement of approximately 89 panels with new fire alarm panels will enhance fire alarm reporting capability. The locations will be selected based on existing panels or moved to a location as required by DOE STD-1066-99. The specific manufacturer will be selected based on an evaluation of site-wide consistency.

Conclusions

Alternative #2 is the likely optimum solution. The general work scope for replacement of the fire alarm system would consist of the following:

- Study availability of equipment meeting the specific needs of INTEC
- Study the existing methods of wiring for reuse in the new system
- Design Phase (Conceptual, Title I, Title II)
- Construction Phase and Title III Support
- Fire Alarm Panel Outage preparation
- Installation and testing
- Turnover and close out.

Occupant notification, a fire watch, and restriction of activities will be performed during fire alarm panel outages. Based on the specific type and model of fire panel selected, the use of existing wiring and fiber optics will be evaluated to the feasibility of reusing verses installing new wiring.

INEEL HIGH VOLTAGE EQUIPMENT REPLACEMENT

Problem Statement

The age of some of the INEEL high voltage equipment is between 20 and 51 years old. The equipment includes transformers, switchgear, and circuit breakers. Some transformers have live exposed terminals, are rusting, and leak fluid. The equipment is no longer made and replacement parts are no longer available. The Supervisory Control and Data Acquisition (SCADA) hardware and software vendors are no longer supporting some of the equipment or are no longer supplying replacement parts.

Background

The following pieces of high voltage equipment are planned for replacement through the year 2010.

Substation	Asset Number	Asset Description	Size/Rating	Date of Manufacture
Antelope	T5-220	Transformer	55 MVA/138 KV	1957
Antelope	B103	Circuit Breaker	145 kV/1200A	1957
Antelope	B164	Circuit Breaker	145 kV/1200A	1981
Scoville	8T1-2	Transformer	10.5 MVA/132 KV	1970
TRA	8T3-1	Transformer	4.7 MVA/132 KV	1950
TRA	8T3-2	Transformer	4.7 MVA/132 KV	1950
TRA	8T3-5	Transformer	20 MVA/132 KV	1956
TRA	8T3-6	Transformer	20 MVA/132 KV	1956
TRA		ATR Switchgear	15 KV/1200A	1962
NRF	8T4-1	Transformer	2.9 MVA/132 KV	1950
NRF	8T4-2	Transformer	2.9 MVA/132 KV	1950
NRF	8T4-3	Transformer	4.7 MVA/132 KV	1956
NRF	8T4-4	Transformer	4.7 MVA/132 KV	1956
NRF	8T4-5	Transformer	4.2 MVA/132 KV	1963
NRF	8T4-6	Transformer	4.2 MVA/132 KV	1963
TAN	8T5-1	Transformer	7.5 MVA/132 KV	1953
TAN	8T5-2	Transformer	7.5 MVA/132 KV	1953
EBR-II	8T11-1	Transformer	16 MVA/132 KV	1958
EBR-II	8T11-2	Transformer	16 MVA/132 KV	1958

Some of the identified transformers have live exposed fronts and are considered a safety hazard. The transformers with live exposed fronts are enclosed within a fenced area; however, the area is accessed by personnel performing other nonrelated work. In addition, some of the transformers are leaking fluid.

The SCADA that is used to remotely operate the high voltage equipment has software and hardware that is either no longer manufactured or no longer supported. Replacement parts and software updates are no longer available.

Specific Drivers

The main driver for this project is the ability for Power Management to provide safe, reliable power continuously to the INEEL.

There is no one document that contains requirements for replacement high voltage equipment. There are, however, documents that recommend maintenance practices and determine approximate useful design life. In addition, the INEEL is required to practice energy efficiency, energy management, and energy conservation. These are implemented in various DOE orders, DOE A/E Standard, MCP-2811, Engineering Change Control, Secretary of Energy Memorandums and Presidential Memorandums. Replacement of the high voltage bus equipment is necessary for the INEEL to continue to perform energy efficient operations of government facilities. New transformers have increased efficiency and are safer to operate using less flammable dielectric media.

DOE service life of equipment states that expected life of distribution and transmission transformers is 30 years. The age of the transformers listed above range from 31 to 51, far exceeding their design life.

The service life of computer and computer-related equipment is 3 to 7 years. This is the main driver for keeping the SCADA updated with current technologies.

Alternatives/Evaluations

There are three options that are considered for this evaluation. With each option, there are identified consequences that may result from the option. The options are generated using best engineering judgment based on past historical events. Another option to be pursued during conceptual design would be to sell the INEEL electrical power distribution system to a power company.

<u>Alternative #1</u> Do not replace the high voltage equipment. Do not upgrade the SCADA to current technologies.

The consequences could be severe. If one of the identified pieces of equipment fails, replacement parts are not available. There is a risk if failure on one transformer could cause the other redundant transformer to fail resulting in a loss of power to a facility. In addition, some of the identified transformers have live exposed fronts and are considered a safety hazard.

Some of the transformers are leaking fluid into control cabinets and on the outside of the transformer. This could be come an environmental issue.

Remote operation of the INEEL T&D allows the dispatcher at Scoville to monitor and control the INEEL power loop. Without remote operation available, Power Management cannot supply reliable and uninterrupted power to the INEEL. In addition, without remote operation, Power Management linemen are required to *man* the substations. Currently, Power Management does not have the manpower to perform this task.

Alternative #2 Send the equipment to be rebuilt or remanufactured.

In order for a manufacturer to rebuild a transformer, it has to be transported to a facility that performs that function. The length of time is a significant factor in determining whether this alternative is feasible. The length of time is between 3 to 6 months and would require an outage of this duration. During this outage period, the redundancy feed is lost. When comparing the cost of rebuilding a transformer to the cost of buying a new one, the outage cost is more for a rebuilt transformer but the cost of a rebuilt is less than a new one. Overall, the equipment cost would be approximately the same. Therefore, considering the inconvenience of an extended outage, it is more desirable to purchase new transformers than to rebuild. In addition, engineering cost would be lower for purchasing new equipment due to the ease of designing around new verses rebuilt.

Alternative #3 Replace the existing INEEL high voltage equipment.

This alternative is the most feasible based on cost, engineering, outage minimization, and increased reliability. New transformers, circuit breakers, and switchgear come with a warranty that exceeds the warranty for a rebuilt unit.

In order for the INEEL high voltage transmission system to be functional to its scheduled date based on the Infrastructure Long-Range Plan, new equipment has to be installed and utilized to provide the required service life.

Update the SCADA to current technologies. An operational SCADA is critical to Power Management’s mission to supply safe, reliable, and uninterrupted power.

Conclusions

Alternative #3 is the likely best choice for upgrades to the high voltage equipment.

The general work scope for replacement of the INEEL High Voltage Equipment Replacement would consist of the following:

- Design Phase (Conceptual, Title I, Title II)
- Construction Phase and Title III Support
- Outage preparation
- Installation and testing
- Turnover and close out.

The design phase would select the appropriate high voltage equipment based on current and future needs of the facility. Existing ratings of the piece of equipment will be used as a baseline. Engineering will integrate the new equipment with existing pads and structures for ease of installation. An outage plan will be developed by both the operating contractor and the subcontractor to minimize duration and complexity of the outage. The construction phase would consist of procuring and installing the equipment. Manufacturers recommended testing and other applicable INEEL Power Management testing requirements would be performed before the high-voltage equipment is released for operation.

INEEL ROAD SYSTEM UPGRADES

Problem Statement

Portions of the INEEL road system must be properly maintained to support fuel and waste vehicle transports to/from/between INEEL facilities.

Problem Description

The INEEL road system is comprised of over 17.5 million square feet of paved surface. Approximately 9.2 million square feet of roadway has been identified as being critical to the INEEL mission. The Pavement Condition Index (PCI) Report for 2000 provides the comprehensive list of critical roadways. The critical roadways were determined using the INEEL "FY 1998 LICP, INEEL Roads Rehabilitation – Waste Shipments" document.

The Integrated Services Department performed a predictive analysis on the critical pavement sections at the INEEL during the summer of fiscal year (FY) 2000. This analysis was performed in accordance with DOE Order 430.1A. All pavement surfaces identified by the PAVER computer program were reviewed for determination of need to perform a visual inspection. A report was compiled that provides detailed, section-by-section, branch-by-branch quantities and PCIs based on deficiencies identified from the inspection effort.

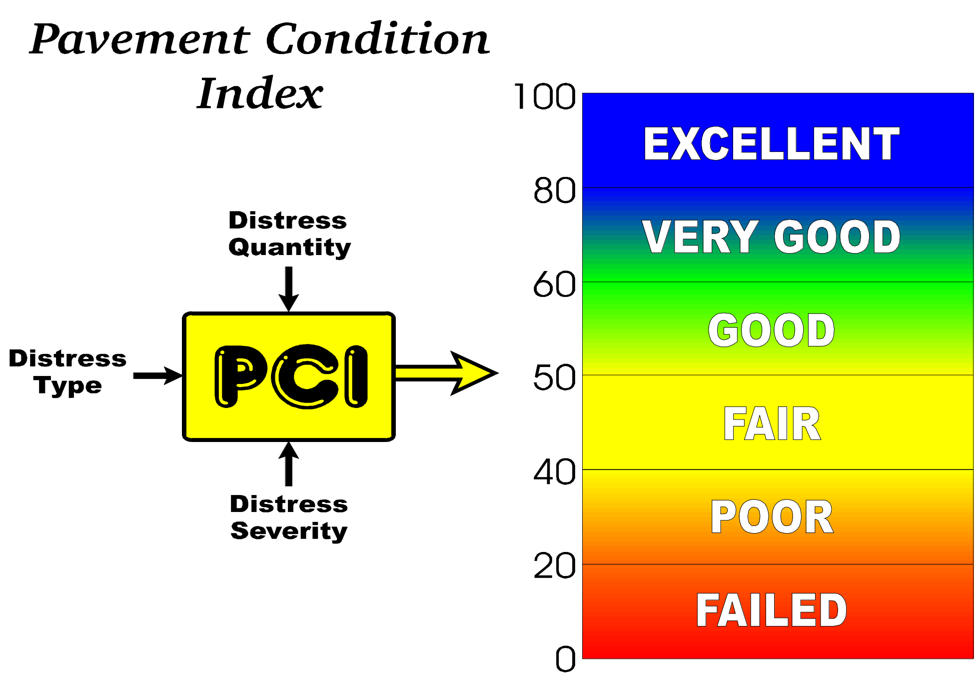

Figure E-1. PCI graphic.

The PCI is a numerical index, ranging from 0 for a completely failed pavement to 100 for a pavement that is in perfect condition. Calculation of the PCI is based on the results of a visual condition survey in which distress type, severity, and quantity are identified. A PCI was developed for each identified road within the INEEL to provide an index of the pavement's structural integrity and surface operation condition.

The PCI of a particular structure will get smaller as a pavement deteriorates with time and use. As the PCI decreases, so does the usability of a pavement structure. Also, the lower a PCI number, the more work is required to restore the pavement to acceptable standards.

Pavement structures are exposed to two basic deteriorating factors. The first is extremes in temperature and the second is varying amounts and magnitudes of repetitive loads from the wheels of vehicles. This factor is usually expressed in the weight transferred by the axles of vehicles. All pavements will also deteriorate with time. As the pavement ages, it will exhibit various levels of deterioration until it reaches the stage of needing to be extensively repaired or even replaced. Pavements with high usage will show greater deterioration due to loads rather than weathering. Those pavements with less usage will most likely indicate a higher deterioration from the weather.

The best opportunity for cost savings is to plan for and begin upgrades and/or maintenance projects prior to any facility reaching the critical point on the deterioration curve. As shown in Figure A-2, the critical point is the start of the significant drop condition.

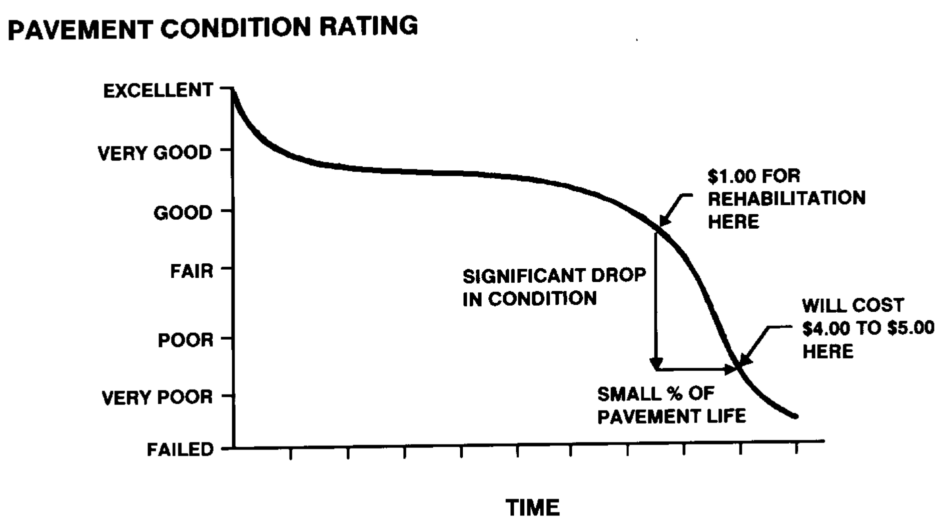

Figure E-2. Pavement Rating Diagram.

Specific Drivers

The projected end of the fuel and waste vehicle transports to/from/between INEEL facilities is FY 2035, according to the INEEL "FY 2098 LICP, INEEL Roads Rehabilitation–Waste Shipments" document shown in Table A-1. The roads along the shipping routes must be maintained in acceptable working order to allow for the continuation of the INEEL site mission.

Alternatives/Evaluations

- Do nothing or delay the upgrade. The roadways will continue to deteriorate until such time that they will become greatly more expensive to maintain. Reference Figure A-2: Pavement Rating Diagram for the rehabilitation dollar value of a pavement over time. Future fuel/waste shipment routes may need to be altered to avoid roads that will have failed.

- Complete the proposed maintenance on the identified roadways to ensure non-diverted fuel/waste shipments.

Conclusion

It is recommended that the roadways identified for mission-critical transportation routes be upgraded. (Summarized below from the 2000 Paver Report.) Upgrades to these INEEL mission-critical roadways will ensure the continued successful shipments within the site complex.

INEEL CRAFT CONSOLIDATION

Problem/Opportunity

With decreasing programs in the support areas served by CFA craft personnel and the planned inactivation of many facilities at CFA, the demand for craft diminishes and a consolidation of functions to a single area of the site is believed to provide net cost benefits.

Background

Consolidation of craft services at one central site and activation of outlying facilities will realize considerable savings in maintenance and upgrade costs. This effort investigated the deactivation of craft services at CFA and consolidation with the existing craft services at INTEC. A walkthrough of the buildings under consideration resulted in recommendations based on the following considerations:

- The age of the buildings and structural integrity
- Health and safety concerns
- Operational impacts
- Repairs and renovations
- Need for increased efficiency
- Optimization of space.

INTEC buildings considered for the consolidation of craft activities are CPP-663, CPP-1636, CPP-1637, and CPP-1653. Deficiencies observed during the walkthrough included:

- Lack of personnel sanitation facilities
- Inadequate Life Safety Systems
- Lack of fire protection
- Lack of communications, voice, and data where personnel will need to be accommodated
- Inadequate heating, ventilating, and air conditioning (HVAC) for tenant occupancy.

These problems and deficiencies may be mitigated through the following assumptions. Those that need to be addressed and reconciled by this task will be included in the cost estimate for upgrades.

- INTEC buildings CPP-1636 and CPP-1637 will be completely upgraded using the FY 2004 General Plant Project (GPP) funding. The upgrade will allow for housing of all anticipated personnel from CFA without additional modification.
- INTEC building CPP-1653 will be partially upgraded using the FY 2004 GPP funding. The upgrade will establish restroom and shower and locker facilities capable of supporting up to 30 tenants and refurbish the mechanical/highbay area to support maintenance, storage, and repair activities consistent with the work performed by the anticipated personnel from CFA.

- The office, break room, and conference room areas will not be upgraded using FY 2004 GPP funding.
- Actual movement of personnel, equipment, and supplies into or out of any of the facilities identified in the alternative will be accomplished using operational budgets.
- Deactivation, decommissioning, and demolition activities and costs of inactivated facilities are not considered within the scope of this consolidation.

Specific Drivers

- DOE-ID A/E Standard
- NFPA 70, NEC
- Illuminating Engineering Society (IES) of America

Alternatives/Evaluations

Three alternatives were considered for this evaluation. With each option, there are identified consequences that may result from the option. The alternatives integrate best engineering judgment including the identified drivers and past historical events.

<u>Alternative #1</u> Integrate CFA painters, electricians, mechanics, pipe fitters, and carpenters in with like crafts at INTEC in buildings CPP-663, CPP-1636, and CPP-1637. The functional teams would integrate with like functions in INTEC buildings CPP-663 and CPP-697. Work control and management would integrate with INTEC work control in CPP-663. Equipment operators (EOs), laborers, and roads/grounds equipment would go into approximately 5,000 sq. ft of CPP-1653 and upgrade CPP-1653 to provide 5,000 to 7,000 sq. ft for the power management function.

The tenant-occupied areas in CPP-1653 will require removal of existing wood-framed construction and worn, deteriorating finishes. New metal stud partitions, surface finishes, and a suspended ceiling will be required. Voice and Data services, life safety service, and electrical service to office equipment including lights will also need to be installed. Mechanical HVAC will need to be modified to include adequate heat and air conditioning to provide for tenant comfort.

Paving upgrades will be performed to CPP-1653 to accommodate personnel vehicle parking and service vehicles and heavy equipment to the high bay areas. The force account fabrication shop, the cell mockup, and the drill equipment located in CPP-1653 would be moved to another facility or excessed.

<u>Alternative #2</u> Integrate CFA painters, electricians, mechanics, pipe fitters, carpenters, and functional teams into CPP-663, CPP-1636, and CPP-1637. Upgrade the Coal Fired Plant to provide space for roads and ground functions (EOs and laborers), power management function, and craft-specific training.

This option is not viable at this time. The Coal Fired Plant has been identified for other uses and is not available for housing additional functions.

<u>Alternative #3</u> Integrate CFA painters, electricians, mechanics, pipe fitters, carpenters, and functional teams into CPP-663, CPP-1636, and CPP-1637. Construct a new facility to house the roads and grounds function (EOs and laborers) and the power management function. This option is not viable at this time. Construction of a new facility is not feasible as higher priority capital needs supercede this scenario.

Conclusion

The cost-effective alternative is #1—integrate CFA painters, electricians, mechanics, pipe fitters, and carpenters at INTEC in buildings CPP-663, CPP-1636, and CPP-1637; the functional teams in CPP-663 and CPP-697; the work control and management function in CPP-663; EOs, laborers, and roads/grounds equipment in CPP-1653; and the power management function in CPP-1653.

Table A-1. Cost-Effective Alternative Craft Locations and Numbers.

Group	Preferred Location	Personnel	Required Area (sq. ft)	Additional Requirements
Work Control and Management	INTEC-663	17	100 file room	—
Power Management	INTEC-1653	9	5,000 to 7,000	5 garage stalls
EOs/Laborers (Roads and Grounds)	INTEC-1653	20	1,500 muster area 5,000 garage area 1,500 inside material storage	Outside work area equivalent to around CFA-660 Outside parking for 17 vehicles 12 large and 15 small pieces of equipment
Functional Teams	INTEC-697 and -663	11	1,250 shop 100 secure storage	Parking for 5 vehicles Sling testing Hoisting/rigging van
Painters	INTEC-663	2	500 for sign machine	Parking for 1 vehicle
Electricians	INTEC-663	7	500 shop	Parking for 3 vehicles
Mechanics	INTEC-663	4	350 shop 50 chemical storage	Parking for 2 vehicles
Pipe fitters	INTEC-663	6	500 shop	Parking for 3 vehicles
Carpenters	INTEC-1636 or -1637	4	2,500 combined tent/carpenter 400 material storage	Parking for 2 vehicles Scaffolding trailer, saws, bander, and jointer

INEEL WAREHOUSE CONSOLIDATION

Problem/Opportunity

In order to take advantage of the opportunity to consolidate site material management operations to INTEC, the following problems need to be resolved:

- Upgrade and/or modify existing warehouse facilities or storage capacities at INTEC to accommodate storage requirements for store stock, spares, chemicals, and flammables items

- Move items currently stored at CFA-601, RWMC-655, and TRA-662 to these INTEC facilities.

Background

The INEEL long-range plan includes efforts for infrastructure optimization to support INEEL programs. The mission for INTEC programs extends beyond the year 2035. To accomplish this mission in the most efficient manner, the INTEC area is the prime candidate for locating a consolidated warehouse operation. This consolidated warehouse operation will provide service to all other INEEL site areas as well. The INTEC facilities determined to have the best storage potential are INTEC-654, -660, -1606, and -1635. Currently, CFA-601 provides storage for the majority of store stock items including chemicals and flammable items. RWMC-655 and TRA-662 contain spares for critical systems.

- INTEC-654 provides storage for INTEC and Test Reactor Area (TRA) spares. The facility requires no major capital upgrades or improvements to accommodate any additional storage requirements; however, the facility heating system could be improved by adding additional propane heating units. There are some propane heaters located in INTEC-655 that could be used in this facility. The storage capacity could be improved by excessing items no longer needed and by rearranging pallet racks and storage cabinets.

- INTEC-660 was designed and approved for chemical storage. The facility also contains personal protective equipment (PPE) and provides storage for gas cylinders. The facility requires no major capital upgrades or improvements to accommodate any additional storage requirements; however, the floor should be re-painted. There is also evidence of a minor leak in the steam system that could be repaired using regular maintenance funding.

- INTEC-1606 contains items held for future projects. The facility requires an upgrade to the heating system by adding twenty-one 25-kW heating units. The storage capacity could be increased by excessing items no longer needed and by improving the pallet rack and storage cabinet arrangement. Removing the ceiling steam heating ducts could also increase the storage capacity by adding a level to the pallet racks.

- INTEC-1635 is designated for storage of chemicals and flammable items. The facility is relatively new and requires no major capital upgrades or improvements to accommodate any additional storage requirements; however, the heating system could be upgraded by adding three 25-kw electric heating units. There are minor repairs required such as an oil leak in the air compressor that can be repaired using maintenance funding.

- Warehouse items contained in CFA-601, RWMC-655, and TRA-662 should be relocated to the above-mentioned INTEC facilities after the storage capacities have been increased. This effort does not require any major capital funding.

- CFA-674 excess disposal warehouse, materials, and support personnel should be relocated to CFA-601. Excessing activities include main issue warehouse residing in CFA-674B, -674C, and -674D and computer excess residing in CFA-674A. Current projections indicate that approximately 34,000 sq. ft will be required for excess activities and another 6,500 sq. ft for PC redistribution activities. Facility modifications are only needed to inactivate the steam system and upgrade the electrical system for electrical heating of the warehouse storage area. This allows the CFA-674 facility to be inactivated.

Specific Requirements

N/A

Alternatives/Evaluation

There are two alternatives that are considered for this evaluation. Consequences are identified with each of the two options.

Alternative #1 Do not consolidate the site material management operation.

Minor repairs and upgrades would not be a priority; however, they would be required to maintain or improve the current facility conditions. The major site initiative to locate INEEL service facilities and operations at or near INTEC would have a negative impact in supporting long-term programs at the site. Also, it would require maintaining facilities in areas that will no longer support on-going site missions.

Alternative #2 Make the minor repairs and upgrades and consolidate the site material management operation in the preferred consolidation arrangement listed below.

- INTEC-654 Excess items no longer needed. Use the acquired space for store stock items currently located at CFA-601. Also, this facility could be used to store some of the spares from the Radioactive Waste Management Complex (RWMC) and TRA in addition to spares currently located at INTEC-663.

- INTEC-660 Relocate the PPE items. Move the chemicals currently located at CFA-601 to this facility.

- INTEC-1606 Excess items no longer needed. Use the acquired space for store stock items currently located at CFA-601. Also, the facility could be used to store some of the spares from RWMC and TRA.

- INTEC-1635 Move the flammables currently stored at CFA-601 to this facility.

- CFA-601 Upgrade this facility to house the site excessing activities.

Conclusion

The likely cost-effective alternative is #2—making the minor repairs and upgrades to INTEC-654, -660, -1606, and -1635 and CFA-601 and proceed with the proposed consolidation. The scope would entail a planning and implementation phase for the heating upgrades to INTEC-1606, INTEC-1635, and CFA-601. The minor repairs should be performed on a regular maintenance schedule. The relocation of warehouse items should be included in the appropriate yearly operational budget forecasts.

IRC LABORATORY UPGRADES

Problem

In order for the INEEL Research Center (IRC) to continue providing viable research laboratories and office space to researchers in Idaho Falls, the following issues will need to be addressed:

- The IF-603 fume hood exhaust system is deteriorating and provides marginal service to the numerous laboratory fume hoods. Frequent repairs are required on the many blowers that are part of the exhaust system. Duct over-pressurization alarms occur frequently and exhaust air is often entrained around this facility allowing fume hood exhaust to re-enter the facility through fresh air intakes.

- The inlet guide vanes on the main HVAC fans for IF-602 require frequent repair/replacement and the parts are no longer available from the manufacturer.

- With increasing electrical loads in IF-602, the existing cooling system is not able to effectively cool the facility during summer months.

- The electrical distribution system at IRC-602 does not meet current electrical codes and standards. The electrical distribution system for IRC-602 is operating at capacity and the transformers and circuit panels have no more room for growth.

Background

The existing IF-603 Laboratory fume hood exhaust system was constructed out of galvanized sheet metal. The corrosive fumes that this system handles have removed the galvanized finish of the ducting and the steel is corroding at a rapid rate. The exhaust system is divided up into five air handling zones (2 through 6) that move a total of 101,490 cfm.

> Some of the ductwork in the penthouse of the facility has to be monitored to ensure that the duct pressure does not go positive relative to atmospheric pressure. Duct over-pressure alarms occur frequently on this system.
>
> The original design of this facility assumed that the fume hoods would be operated only on an “as needed” basis. A modification performed in 1995 changed the operation of the exhaust system so that the individual fume hood fans are required to operate 24 hours a day. These fans fail on a routine basis, causing unscheduled outages and maintenance work to repair the fan.
>
> The fume hood exhaust exits the facility through vertical louvers on the penthouse. This configuration allows the fume hood exhaust to be entrained in the building envelope, and fumes often re-enter the facility through the fresh air intakes.

The HVAC system for the office building, IF-602, consists of two air-handling zones. Each zone includes an air handler and a return air fan. The air handlers each move ~23,000 cfm with 25-horsepower motors and the return air fans each move ~20,750 cfm with 7.5-horsepower motors. The airflow from these air handlers is modulated by the use of inlet guide vanes. The guide vane assemblies are prone to heavy wear and they have failed numerous times. Replacement parts for these assemblies are no longer available.

With the increasing heat loads in IF-602, the cooling system is no longer capable of effectively cooling the office space during the summer months. Circulating groundwater from a well, through the air handlers and back into an injection well, provides cooling for this facility. The supply well contains a submerged pump that is rated to move ~300 gpm. The flow rate is split between the two air handlers serving IF-602 so that each cooling coil receives 150 gpm of well water at ~55°F. While the heat loads in the facility have gone up over the past 20 years, there have not been any upgrades performed to the cooling system.

IRC-602 was originally built in the early 1980s. At the time of installation, each office area had either no computer or possibly one desktop computer. Since that time, desktop computers and other electronic equipment has become a mainstay for office equipment. Currently most office area's have at least 2 computers and a printer, with some rooms and offices having up to 10 desktop computers. This has resulted in utilizing all spare capacity on the 120/208-VAC panels. As each circuit was added throughout the facility, conduit fill was met or exceeded violating requirements of the NEC. This additional load has increased the load on the 300 KVA 480-208/120 VAC transformer to operate at its capacity. Some of the lighting circuits and receptacle circuits have used the electrical conduit as the ground conductor. This is in violation of the current DOE-ID A/E Standard. The standard requires that each circuit shall have a separate grounding conductor and be identified per the NEC.

Specific Drivers

- DOE-ID A/E Standard
- NFPA 70, NEC
- CFR, Title 10 Energy, Part 73—"Physical Protection of Plants and Materials"
- DOE Order 430.1—"Life-Cycle Asset Management"
- DOE Order 5480.19—"Conduct of Operations Requirements for DOE Facilities"

Alternatives/Evaluation

IF-603, Laboratory Exhaust System

Alternative #1 Do nothing.

The galvanized sheet metal ducting will continue to deteriorate and duct leaks will increase the load on a system that is already at its capacity. Duct overpressure alarms will increase in frequency.

Frequent corrective maintenance associated with the individual fume hood blowers will continue. Fumes will continue to re-enter the facility due to the vertical exhaust ports on the penthouse.

Alternative #2 Replace ductwork and leave all fans in place.

This alternative would leave all of the individual fume hood blowers and the heat recovery fans in place. The galvanized sheet metal ducting would be replaced with corrosion-resistant ducting in the same configuration, as it currently exists. Frequent corrective maintenance associated with the individual fume hood blowers will continue. Fumes will continue to re-enter the facility due to the vertical exhaust ports on the penthouse.

Alternative #3 Replace ductwork and fans in penthouse only.

This alternative would remove the individual fume hood blowers, heat recovery fans, and all ductwork in the penthouse level of the facility. Each zone of the exhaust system would be re-configured to utilize a single exhaust fan, or fan system, that would be mounted on the exterior of the facility. These fans would be similar to the Strobic Air fans that are a stackless exhaust system that is capable of discharging fumes/vapors outside of the building envelope. This will prevent the fumes/vapors from re-entering the facility through the fresh air intakes. All of the galvanized steel ductwork in the penthouse level of the facility would be replaced with a material that is compatible with organic acids. The new ductwork would be configured to maintain the heat recovery glycol loops that preheat the fresh air supply. The existing heat recovery fan control systems will be modified to control and monitor the new exhaust fan system.

Alternative #4 Replace exhaust system in its entirety.

This alternative includes all of the work described in Alternative #3 above and also includes the replacement of the ducting from the penthouse level down to the individual fume hoods. The trunk line exhaust system associated with Zone 6 is not included in this scope of work. The fume hood exhaust ducting, associated with Zones 2 through 5, consists of 14-in. spiral wound galvanized steel ducting that is insulated. The ducting is routed from the individual fume hood blowers in the penthouse level of the facility down to the mezzanine level where it branches out to the actual fume hood locations. The mezzanine level is directly above the laboratory modules and is ~10 feet in height. The only access to this ducting is through the false ceilings of each laboratory module. The existing Phoenix Controls systems for each laboratory module will be left in place.

IF-602, HVAC Fan Upgrade

Alternative #1 Do nothing.

The inlet guide vanes will continue to require frequent corrective maintenance, and unplanned outages of this system will occur. The repair of this hardware will continue to use miscellaneous hardware that has to be modified for this service.

Alternative #2 Upgrade the fan and motor assemblies to include variable frequency drives (VFDs). In order to obtain the optimum equipment for this type of application, both the motors and the fan assemblies will be replaced. The direct digital control system will need to be modified to continue to control and monitor the operation of these fans.

IF-602, Cooling Capacity Upgrade

Alternative #1 Do nothing.

Facility operations will continue to lose control of the temperatures in this facility during the summer months. On hot days, the space temperatures will raise above normal comfort levels, impacting ~300 employees.

Alternative #2 Provide additional cooling to effectively chill the well water being sent to the two air handlers. The well water supply line will need to be intercepted prior to the air handler cooling coils so that additional cooling of the water can be performed. An existing equipment support platform on the roof of the facility can be utilized to mount the needed equipment. In order to chill the well water an additional 5°F, a chiller with a capacity of ~65 tons of cooling will be required.

IF-602, Electrical Upgrade

Two options are considered for this evaluation. With each option, there are identified consequences that may result from the option. The alternatives are generated using best engineering judgment generated from identified drivers and based on past historical events.

Alternative #1 Do not modify the IRC-602 electrical distribution system. This will inhibit future growth or expansion for this research laboratory. In addition, operation of transformers at or near capacity will reduce it design life.

Alternative #2 Install increased capacity for distribution panels and correct electrical codes and standards violations.

Installation of two new transformers at the second and third floor each feeding two new 3-phase 208/120 VAC distribution panels would reduce load on the main 300-kVA transformer and provide capacity for growth and expansion. In order to comply with the NEC and DOE-ID A/E Standard, each conduit feeding a load will have to be checked for conduit fill and sized accordingly. Installing a separate ground conductor for each circuit will also be required. Use of pull-by's or re-pulling wire in existing conduits would be required.

Conclusion

The scope of work that is included with each of these recommendations includes Title I and II design as well as construction. The likely cost-effective alternatives for each phase of this project are listed below:

IF-603 Laboratory Exhaust System

Realizing that the actual scope of work may change as more data are obtained, the likely alternative, at this time, is to proceed with Alternative #4. This alternative is the complete replacement of the fume hood exhaust system from the individual fume hoods to the exterior of the facility.

IF-602 Office Building HVAC Upgrade

Alternative #2 is the likely solution. The frequent equipment repairs will be eliminated and a considerable amount of energy will be saved by better use of electrical energy due to the installation of the VFDs.

IF-602 Office Building Cooling Capacity Upgrade:

Alternative #2 is the likely solution to the cooling problems that exist in this facility.

Office Building Electrical Upgrade

The likely alternative for correction of the electrical deficiencies in IRC-602 is Alternative #2. A field survey will be required to identify selection of equipment locations. A load study would be required to correctly size the new transformers and distribution panels.

Required Roadway Reconstruction/Upgrade

ANL-01	Buchanan Boulevard		Total Area = 88,106		Required 2007-2009
	Section	**From**	**To**	**Area**	**Upgrades**
	01	South Curve	Argonne Security Gate	53,056	Spot Repairs, Overlay, and Chip Seal
	02	Buchanan Curve	Harrison Curve	12,150	Spot Repairs, Overlay, and Chip Seal
	03	STA 13+00	North Curve	22,900	Spot Repairs, Overlay, and Chip Seal

CFA-04	Ogden Ave		Total Area = 187,850		Required 2007-2009
	Section	**From**	**To**	**Area**	**Upgrades**
	01	Lincoln Blvd	Main Street	33,300	Spot Repairs and Chip Seal
	02	Main Street	Nevada Street	15,350	Spot Repairs and Chip Seal
	03	Nevada Street	Oregon Street	25,000	Spot Repairs and Chip Seal
	04	Oregon Street	Portland Ave	114,200	Spot Repairs and Chip Seal

CFA-W	CFA-1611 Fire Station		Total Area = 55,300		Required 2007-2009
	Section	**From**	**To**	**Area**	**Upgrades**
	01	Lincoln Blvd	Colorado Street	55,300	Spot Repairs and Chip Seal

CFA-X	CFA-1612 Medical Facility		Total Area = 30,300		Required 2007-2009
	Section	**From**	**To**	**Area**	**Upgrades**
	01	Lincoln Blvd	Colorado Street	30,300	Spot Repairs and Chip Seal

CFA-Y	CFA Fire Training Facility		Total Area = 65,500		Required 2007-2009
	Section	**From**	**To**	**Area**	**Upgrades**
	01	Colorado Street	Around Fire Training	65,500	Spot Repairs and Chip Seal

CPP-01	**Cleveland Boulevard**		**Total Area = 72,960**		**Required 2007-2009**
	Section	**From**	**To**	**Area**	**Upgrades**
	01	Lincoln Blvd	Guard Gate	72,960	Reconstruction

CPP-02	**CPP Perimeter Road**		**Total Area = 185,836**		**Required 2007-2009**
	Section	**From**	**To**	**Area**	**Upgrades**
	01	Cleveland Branch	East Side of CPP Facility	185,836	Reconstruction

CPP-03	**Ash Avenue**		**Total Area = 75,176**		**Required 2007-2009**
	Section	**From**	**To**	**Area**	**Upgrades**
	01	Cleveland	Interior Security Fence	12,500	Spot Repairs and Chip Seal
	02	West Security Fence	East Security Fence	45,000	Reconstruction
	03	East Guard House	East Perimeter Road	10,919	Reconstruction
	04	Cleveland Blvd	West Perimeter Road	5,059	Reconstruction

INEL-01	**Lincoln Boulevard**		**Total Area = 4,369,408**		**Required 2007-2009**
	Section	**From**	**To**	**Area**	**Upgrades**
	01	Main Street	Ogden Avenue	108,000	Spot Repairs, Overlay, and Chip Seal
	02	Ogden Avenue	Portland Avenue	44,920	Spot Repairs, Overlay, and Chip Seal
	03	Portland Avenue	STA48+95.25	44,920	Spot Repairs, Overlay, and Chip Seal
	04	STA48+95.25	STA 105+60	226,470	Spot Repairs, Overlay, and Chip Seal
	05	STA 105+60	Cleveland Ave	233,160	Spot Repairs, Overlay, and Chip Seal
	06	Cleveland Blvd	STA 185+69.01	87,200	Spot Repairs, Overlay, and Chip Seal
	07	STA 185+69.01	STA 233+00	189,240	Spot Repairs, Overlay, and Chip Seal
	08	STA 233+00	STA 275+60	170,400	Spot Repairs, Overlay, and Chip Seal
	09	STA 275+60	STA 318+20	170,400	Spot Repairs, Overlay, and Chip Seal
	10	STA 318+20	STA 360+76.45	170,258	Spot Repairs, Overlay, and Chip Seal
	11	STA 360+76.45	STA 15+00, N of Wash. Blvd	168,400	Spot Repairs, Overlay, and Chip Seal

	12	Washington Blvd	STA 15+00	5,760	Spot Repairs, Overlay, and Chip Seal
	13	STA 15+00	STA 66+70	186,120	Spot Repairs and Chip Seal
	14	STA 66+70	STA 118+40	186,120	Spot Repairs and Chip Seal
	15	STA 118+40	STA 170+00	185,760	Spot Repairs and Chip Seal
	16	STA 170+00	STA 233+50	228,600	Spot Repairs and Chip Seal
	17	STA 233+50	STA 297+00	228,600	Spot Repairs and Chip Seal
	18	STA 297+00	STA 348+50	185,400	Spot Repairs and Chip Seal
	19	STA 348+50	STA 400+00	185,400	Spot Repairs and Chip Seal
	20	STA 400+00	STA 450+85	183,060	Spot Repairs and Chip Seal
	21	STA 450+85	STA 501+70	183,060	Spot Repairs and Chip Seal
	22	STA 501+70	STA 552+55	183,060	Spot Repairs and Chip Seal
	23	STA 552+55	STA 603+40	183,060	Spot Repairs and Chip Seal
	24	STA 603+40	STA 654+25	183,060	Spot Repairs and Chip Seal
	25	STA 654+25	STA 710+58.44, Guard Station	202,824	Spot Repairs and Chip Seal
	26	Guard Station	Franklin Blvd	152,064	Spot Repairs and Chip Seal
	27	Franklin Blvd	Taft Blvd	75,492	Spot Repairs and Chip Seal

INEL-02	**Portland Avenue**		**Total Area = 1,144,200**		**Required 2007-2009**
	Section	**From**	**To**	**Area**	**Upgrades**
	01	US 20/26		123,250	Spot Repairs and Chip Seal
	02	Colorado Ave	Lincoln Boulevard	248,350	Spot Repairs and Chip Seal
	03	Lincoln Boulevard	Main Street	57,900	Spot Repairs and Chip Seal
	04	Main Street	Ogden Avenue	130,000	Spot Repairs and Chip Seal
	05	Ogden Avenue	STA 85+00	170,800	Spot Repairs and Chip Seal
	06	STA 85+00	STA 136+45	188,600	Spot Repairs and Chip Seal
	07	STA 136+45	US 20/26	151,200	Spot Repairs and Chip Seal
	08	East Leg	US 20/26	8,800	Spot Repairs and Chip Seal

INEL-03	Adams Boulevard		Total Area = 641,640		Required 2007-2009
	Section	**From**	**To**	**Area**	**Upgrades**
	01	US 20/26 Highway	STA 50+00	180,000	Spot Repairs and Chip Seal
	02	STA 50+00	End of New Construction	191,880	Spot Repairs and Chip Seal
	03	End of New Const.	RWMC Gate	269,760	Spot Repairs and Chip Seal

INEL-05	Taylor Boulevard		Total Area = 596,600		Required 2007-2009
	Section	**From**	**To**	**Area**	**Upgrades**
	01	US 20	PT 3+68.42	11,500	Spot Repairs, Overlay, and Chip Seal
	02	US 20	STA 37+00	115,100	Spot Repairs, Overlay, and Chip Seal
	03	STA 37+00	STA 77+36.15	135,300	Spot Repairs, Overlay, and Chip Seal
	04	STA 77+36.15	STA 127+00	161,700	Spot Repairs, Overlay, and Chip Seal
	05	STA 127+00	STA 178+20.57	168,200	Spot Repairs, Overlay, and Chip Seal

INEL-06	US 20/26 Central Connector		Total Area = 176,8800		Required 2007-2009
	Section	**From**	**To**	**Area**	**Upgrades**
	01	East Portland	Underpass	81,400	Spot Repairs, Overlay, and Chip Seal
	02	Underpass	US 20/26	95,480	Spot Repairs, Overlay, and Chip Seal

NRF-01	Washington Blvd		Total Area = 163,632		Required 2007-2009
	Section	**From**	**To**	**Area**	**Upgrades**
	01	Lincoln Blvd	Station 233+50	86,880	Spot Repairs, Overlay, and Chip Seal
	02	Station 233+50	NFR Parking Lot	76,752	Spot Repairs, Overlay, and Chip Seal

PBF-01	**Jefferson Blvd**		**Total Area = 579,200**		**Required 2007-2009**
	Section	**From**	**To**	**Area**	**Upgrades**
	01	Portland Ave	STA 52+80	169,000	Spot Repairs, Overlay, and Chip Seal
	02	STA 52+80	STA 105+60	169,000	Spot Repairs, Overlay, and Chip Seal
	03	STA 105+60	STA 160+76.29	180,200	Spot Repairs, Overlay, and Chip Seal

PBF-02	**Cheyenne Road**		**Total Area = 39,300**		**Required 2007-2009**
	Section	**From**	**To**	**Area**	**Upgrades**
	01	Apache Road	Parking Lot 12	39,300	Spot Repairs, Overlay, and Chip Seal

TAN-01	**Nile Avenue**		**Total Area = 280,050**		**Required 2007-2009**
	Section	**From**	**To**	**Area**	**Upgrades**
	01	Lincoln Blvd	STA 24+89.02	74,640	Reconstruction
	02	STA 24+89.02	Loft Gate	205,410	Reconstruction

TRA-01	**Monroe Blvd**		**Total Area = 274,068**		**Required 2007-2009**
	Section	**From**	**To**	**Area**	**Upgrades**
	01	Lincoln Blvd	Guardhouse	270,480	Spot Repairs and Chip Seal
	02	Lincoln Blvd	Monroe (Curve)	3,588	Spot Repairs and Chip Seal

TRA-02	**Swordfish Street**		**Total Area = 61,521**		**Required 2007-2009**
	Section	**From**	**To**	**Area**	**Upgrades**
	01	TRA-658	TRA-620	47,307	Reconstruction
	02	TRA-658	Swordfish Street	14,214	Spot Repairs, Overlay, and Chip Seal